IMPACT OF THE PERFORMANCE-BASED PAYMENTS ON HEALTH WORKERS IN CONTRACTING OUT GOVERNMENT HEALTH SERVICES: CAMBODIA'S EXPERIENCE

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Abstract

Contracting out government health services has been increasing in low and middle income countries (LMICs) and highly valued in improving health service delivery. In some cases, government health workers have been paid performance-based payments; such payments have been quoted to contribute to the achievement. However, impacts of the payments on the health workers' total income including income from their private practice and the government salaries have been little studied, while their private practice have posed serious issues in the service delivery with the constraint from low government salaries. The impacts at the household level have been unstudied.

This study investigated these impacts of the payments paid to the government health workers in a project for contracting out district health service delivery to international NGOs in rural Cambodia. In this study, key informant interviews elaborated payment mechanism and other factors in the incentive environment; household income and expenditure surveys of the health workers' households ascertained their incomes and their households' incomes and expenditures and compared these data between the two tyes of distrctircts (N=250); a mini-survey about payment mechanism at the subcontractor-level deepened understanding of important factors on the impacts; regression analyses of the incomes or expenditures confirmed the impacts of payments in relative to other possible influential factors on incomes and expenditures.

The payments associated with the contracting settings including the performance-based payments were found to increase the heatlh workers' incomes and their households' incomes reasonably sufficiently, while non-recipients' whose income mostly consisted of private practice income. The result of regression analyses supported the higher incomes. Therefore, this study tentatively argued,with further support from the interview result that transfers of the health workers' labour supply from the private to government sector were brought about by the payments, i.e., labour supply increase in the government sector and reduction of dual practice.

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Abbreviations

ADB	Asian Development Bank
CEDAC	Cambodian Center for Study and Development in Cambodia
COD	Operational District Contracted out
CSES	Cambodian Socio-Economic Survey
DFID	Department For International Development
DHS	Demographic and Health Survey
HIV/AIDS	Human Immune deficiency Virus/Acquired immune deficiency syndrome
HNI	HealthNet International
HRH	Human Resources for Health
JICA	Japan International Cooperation Agency
LIS	Luxembourg Income Study
LMIC	Low and middle income countries
LSMS	Living Standard Measurement Surveys
MOD	Operational District managed under Ministry of Health
MOH	Ministry of Health, Cambodia
MOP	Ministry of Planning, Cambodia
NGO	Non Government Organisation
NIPH	National Institute of Public Health
NIS	National Institute of Statistics
OD	Operational District
RHAC	Reproductive Health Association of Cambodia
SRC	Swiss Red Cross
UNDP	United Nations Development Programme
UNICEF	United Nation’s Children’s Fund
UNIFEM	United Nations Development Fund for Women

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Chapter 1 Introduction, Context and Background of This Study

1.1 Context

1.1.1 Performance-based incentives in contracting out health services in international health

Among different types of incentives, financial incentives have increasingly been applied to health workers employed in the government health sectors in low and middle income countries (LMICs), with the intention of improving health service delivery or staff retention in rural areas (Hongoro and Normand 2006; Ensor and Thompson 2006). Effects of financial incentives in LMICs have been little studied, but those studies have showed both positive and negative effects (Makas 2009; Ir et al. 2008; Meach 2006; WHO 2000, MOH 2007; Thornton et al. 2009). Financial incentives need to have specific designs for obtaining the intended results. Careful consideration needs to be given to the interests of both the recipient and those providing the incentives, and to the conditions surrounding the incentives.

The unique incentive environment in the health sector intensifies difficulties in obtaining the intended results. Furthermore, the environment in the LMIC-health sector frequently contains other unfavourable factors which influence the effectiveness of the financial incentives in achieving intended outcomes. Typically, these factors include multiple income sources of the workers (Dercon, S. 2002; Barretta, C. B. et al. 2001; Bryceson, D. F. 1999) and various low capacities of the health authority (McPake et al. 2002; Folland et al. 2004).

Sources of income include those in both the government and the private sectors. In the government sector, some health workers receive supplementary salaries from international cooperation agencies and NGOs for their participation in, or contribution to, projects of these organisations. In the private sector the main source of income comes from dual practice (private practice by government health workers) (WHO 2006); other sources include non-health work such as agriculture and non-agriculture activities (Dercon, S. 2002; McPake et al. 1996; Ersado 2006). Income from private practice is highly likely to compete with other financial incentives in terms of labour supply of health workers in the government sector (Garacía-Prado & González 2007, Ferrinho et al., 2004; Jan et al. 2005).

The income from non-health work carried out by health workers' household members is consideredto be included in the budget of health workers' households, since a household is considered an economic unit of consumption and attempts to maximise utility (Samuelson 1956 cited in Lundberg and Pollak 1993). In the government sector, low management capacity exists not only in the specific management of incentives introduced into the health sector but also in the general management of the sector, such as budget and materials. These features and factors of the incentive environment have not been sufficiently reflected in studies of financial incentives.

Contracting out government health services, which is one of financial incentives, has been increasing in LMICs (Mills 1997 in Bennett et al. 1997; Liu et al. 2004), under the assumption that contracting out achieves a higher degree of efficiency (Milgrom and Roberts 1992) in public services than the same services provided by governments (Mills 1997 in Bennett et al. 1997). The health services are mostly contracted out to well-known international NGOs. The contracting out has also been advocated by major international financial development institutes, bilateral cooperation agencies, and researchers, particularly in those countries labelled as "fragile states" (Carlson et al. 2005). Such organisations have supported contracting out projects in LMICs. Fragile states are those which have weak state capacity of service delivery such as health. This is often due to the underdevelopment of physical infrastructure, human resources, finance, and governance (DFID 2005). The fragile states are exemplified by Afghanistan, Haiti, and Cambodia (DFID 2009a, 2009b) and often include "post-conflict" states (USAID 2006). The advocates of contracting out argued that such projects resulted in improvements in health service delivery (World Bank and Asian Development Bank: ADB 2002b; DFID 2004; Soeters and Griffiths 2003; Loevinsohn and Harding 2004 Arur et al. 2010). Some of these contracting out projects applied performance-based payments to the NGO contractors (Arur et al. 2010) or government health workers who provided services in the project (Soeters and Griffiths 2003).

Performance-based payments have generally been attached to various types of objectives e.g. quantity or quality of health service delivery or health outcomes (Eichler et al. 2009), whereas studies of the effect have been limited in health economics (Liu and Mills 2007). In particular, few studies debated the impact of the payments on the household economy of health workers. This, despite the fact

that a household is the unit of consumption and the household economy is highly likely to be composed of a variety of sources of income of health workers and their household members in LMICs. However, the payments have been much promoted based on a view point which focuses on performance outputs.

1.1.2 Cambodian Contracting out Health Services

The international promotion of the contracting out of government health services reached Cambodia, a fragile state, which faces problems in health service delivery. These contracting out projects were implemented with support from international cooperation organisations. Some of these organisations applied performance-based payments to the health workers. The problems, which were largely in common with other LMICs, included shortage and quality of legal provision in health service delivery, shortage of budget and human resources for health (HRH) and also higher out-of-pocket health expenditure. Persistent dual practice by the health workers decreased their attendance at government health facilities, encouraged harmful practice, and increased out-of-pocket expenditure (Soeters and Griffiths 2003; Vong et al. 2005). The problems also included lower capacity of the Ministry of Health (MOH) (MOH 2002; World Health Organization 2006). They seemed to present challenges to the contracting out projects and the performance-based payments in relation to their ability to achieve the intended objectives.

A pilot project for a contracting out project (herein after called the ADB Pilot Project. ADB: Asian Development Bank) began in the late 1990s, supported by international cooperation organisations. The ADB Pilot Project expected that the contracting out would increase health service delivery in rural areas by increasing the effectiveness and efficiency of service delivery (ADB 2004, P. vii). One of the NGO Contractors introduced performance-based payments into the Operational District, a unit of health service delivery, where they were responsible for increasing the service coverage. The NGO applied the performance-based payments to government health workers who were working for the Operational District.

The pilot project received a positive evaluation, based mainly on an argument that it obtained noticeable achievements: increasing the coverage; improving the quality of the service and improving the equity of the poor (ADB 2004). This high evaluation of the project was shared by some international cooperation organisations, including those which supported the project and some researchers (ADB 2002b, World Bank, Soeters and Grifitths 2003. Bloom et al.2006).

Consequently, this positive evaluation of the pilot project led to the implementation of a larger-scale contracting out project (DFID/World Bank Project).

This new project required NGO Contractors to improve health service delivery at the Operational District level and to apply performance-based payments to government health workers who were working for Operational Districts. However, the contract left the designing of the payments to the discretion of NGO Contractors. The contract included a separate clause from the set indicators of the health service delivery. The clause stated that the health workers were required to abstain from private practice. However, this clause did not specify the degree of abstention required or the method of ensuring it.

This project was assessed in depth by a MOH review (MOH 2007). On the level of performance-based payments, the review argued that the pay level was sufficient (MOH 2007). However, the level was investigated in less depth and without reflecting thoroughly on the incentive environment, which would include the impact of payments on the household economy of health workers. As a result, the impact of payments remained ambiguous as to whether it was large enough to induce the health workers to increase their efforts in the government service. Also, despite that he impact is likely to be influenced by factors in the incentive environment such as income from private practice, these factors were not sufficiently investigated.

1.2 Objective of this study

1.2.1 Objectives

This study aims to explore the impact of performance-based payments on the government health workers' incomes and their household income and expenditures in contracting out government health services in rural Cambodia.

The main goal of this study is to present empirical results for the exploration of the impact of payments on the health workers and their household economy and to describe the compositions of the workers' and their household incomes in relation to the payment in the complex Cambodian incentive environment.

1. Illustrating the payment mechanism of performance-based payments and other payments associated with contracting out and describing the incentive environment surrounding the payments;

2. Describing incomes of government health workers and their household income from different sources by status of Operational District. The status concerns whether the district was contracted out or managed by the ministry of health, and comparing the incomes between the two status groups;

3. Describing household expenditures of the health workers by Operational District status and comparing the expenditures between the two status groups;

4. Exploring the impact of performance-based payments and other incomes to the income of health workers and their household incomes by Operational District status. In the districts managed by the health ministry, exploring the impact of other incomes;

5. Identifying factors influencing different types of incomes and expenditures of the health workers and their households;

6. Evaluating policy implications of the study results in order to make policy recommendations.

1.2.2 Research questions

In order to meet the overall aim and the specific objectives of this study, the following research questions were formulated:

Overall question
What are the economic implications of the different types of health workers' income (e.g. performance-based payments) to their total income and household income?

Detailed questions

1. What are the differences in incomes and expenditures of health workers' households between the two types of districts: one contracted out and another managed by the ministry of health?

2. What is the importance of performance-based payments to health workers' incomes and their household income?

1.3 Outline of this thesis

Chapter 1, as seen here, presents the current experiences, as well as the context, of financial incentives and the contracting out of government health services, some of which accompany performance-based payments in LMICs. This chapter presents the objectives and research questions of this study and outlines this thesis.

Chapter 2 reviews existent theories and literature about the incentive environment, different incentives including performance-based payments and contracting out and those in the health sector. Theser factors in LMICs are focused on. Theroy of Change this study applied is explained.

Chapter 3 outlines the history of Cambodia after the liberation from French colonial control and describes the development of the Cambodian health sector from the early 1990s, including the contracting out projects.

Chapter 4 describes the methodology and methods of this study. This chapter explains the qualitative and quantitative methods used in the study. The chapter then explains the study site and population.

Chapter 5, 6, and 7 present results of this study. Chapter 5 illustrates payment mechanisms for performance-based payments and the implementations of the contracting out project relating to the payments. It also illustrates the incentive environment surrounding the performance-based payments.

Chapter 6 shows the results of analyses of differences in health workers' and their households' income and expenditure. The incomes and expenditures of the two types of Operational Districts are compared.

Chapter 7 explores the impact of the incentive to incomes and expenditures in the contracting settings in comparison with other factors such as attributes of health workers which are hypothesised to change the incomes, employing regression analyses.

Chapter 8 discusses the qualitative evidence for labour supply transfer between the government and private sectors, i.e., a reduction in dual practice. Theses disscussions responses to the research questions presented here in Chapter 1.

Chapter 9 Then, it discusses the contributions and limitations of the study and presents policy recommendations and suggestions for areas of further research.

Chapter 2 Literature Review

Incentives have been increasingly applied to government health workers in LMICs. Included in such incentives introduced in the contracting out of government health services is the attempt either to raise health workers' performances or to retain staff. In this chapter, first, the conceptual framework of this study is stated, followed by the introduction of the research questions of this study. Then, literature related to the framework is discussed from a viewpoint of what has been studied and known about the practical applications and effects of the incentives.

2.1 Conceptual framework

Incentives are factors "allowing individual(s) to behave in accordance with expected material rewards or favours that can be traded for such reward including leisure" (Lindbeck 1997 in McPake and Normand 2008. p.174). Incentives are significant devices by which organisations raise the performance of workers through motivating, retaining, attracting and satisfying them (International Council of Nurses et al. 2008). This is because individuals are perceived to behave in response to material rewards or "favours", such that "incentives are present in every scene" (McPake and Normand 2008. P.174). They are frequently categorized into financial or non-financial incentives and analysed at organisational and individual levels. The incentive environment accommodates the principal-agent relationship described in the principal-agent theory: for example, the workers of a firm (the agents) make efforts on behalf of the interests of the firm owner (the principal). The principal is disadvantaged in obtaining information concerning the agents' performance (information asymmetry); because of this, the agents may cheat and behave opportunistically (Preker et al. 2000). Thus, the principal's obtaining the desired outcome relies on monitoring the agent's performance and applying incentives to induce the agent to make efforts and reduce unacceptable behaviour (Milgrom and Robert 1992).

In the incentive environment in the public sector, financial incentives are highly valued by workers, despite a general assumption that financial incentives are less valued (Wright 2001). This implies that financial incentives have effects on public sector workers. However, characteristics of the public sector, and the health sector specifically, increase the complexity and difficulty for the principal to induce the agent's efforts in its interest. These characteristics include multi-task setting, hierarchy of principal-agent relationships,

increased information asymmetry which disadvantages the principal (McPake and Normand 2008) and intensity of team work required of health workers (International Council of Nurses et al. 2008).

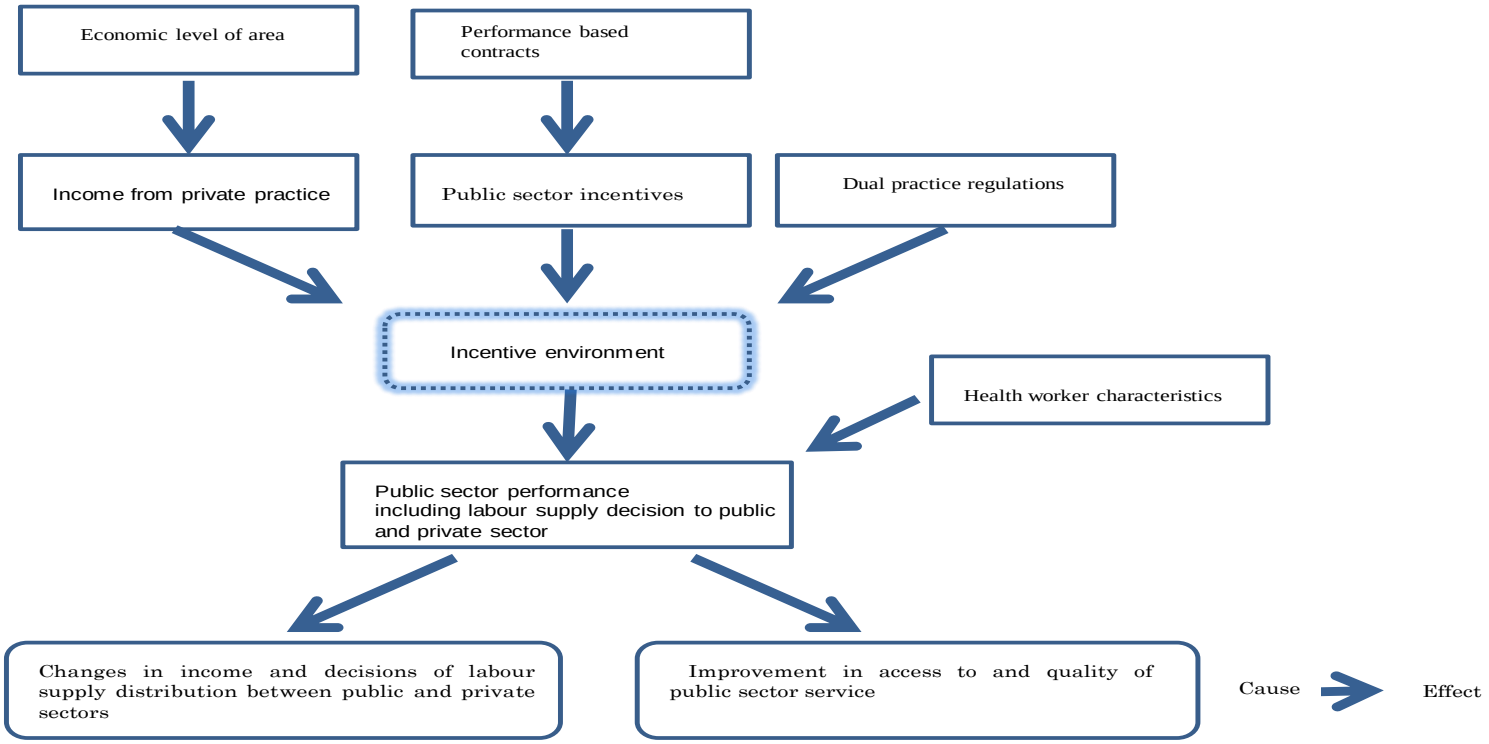

Figure 2.1: Incentive environment in government health sector in Cambodia

Figure 2.1 shows the incentive environment in the government health sector in Cambodia. The public sector incentives contain factors related to the health workers' income which function as incentives. They are fixed salaries, employment conditions such as predetermined salary schedule by cadre, supplementary salaries from NGOs, management practices, and the working environment.

This incentive environment is further shaped by rules and penalties regarding dual practice and opportunities in the private sector. The rules and penalties concerning dual practice restrain or encourage it. The opportunities include income from private practice and working in non-health related work. The income from private practice is likely to be affected by the economic status of the location where the practice is conducted (Ensor et al. 2009) and attributes of the health workers.

The performance-based payments introduced under contracts in Cambodia, considered to be "motivational factors", are expected to increase workers' efforts to raise performance (Figure 2.1). These increased efforts are expected to result in changes in income distributions between public and private sectors and a reduction of dual practice. This scenario would occur if health workers are income maximisers and where performance-based payments produce a higher marginal hourly return from public sector work, for example.

According to literature on characteristics of these incentives and factors in LMICs (Hongoro and Normand 2006; Eichler et al. 2009), without the payments introduced under contracts in Cambodia, the incentive environment that existed was not expected to encourage work motivation or efforts to raise performance. Also, it was not expected that health workers would increase their work hours in the public sector or reduce dual practice and/or private sector non-health work.

However, there are still relatively few studies of the impact of performance-based payments (Eichler et al. 2009) in LMICs, nor is the role they play in the household economies of health workers well understood.

Therefore, this study had the two research questions (Chapter 1, 1.2.2).

1. What are the differences in incomes and expenditures of health workers' households between the two types of districts: one contracted out and another managed by the ministry of health?

2. What is the importance of performance-based payments to health workers' incomes and their household income?

2.2 Incentives

2.2.1 Incentives and the principal-agent relationship

Incentives are applied not only to the micro-management of individuals but also to managing and regulating business and markets, such as a price-cap imposed on public services such as telecommunications, which contribute to the public interest (Normand and McPake 2007).

Designing appropriate incentives has been considered to be one of the core methods for changing the performance of employees in labour economics (Milgrom and Roberts 1992; Holmstrom, and Milgrom 1991). However, as mentioned above, the principal–agent relationship inevitably contains difficulties in applying incentives and in obtaining the intended results from incentives. Information asymmetry also hides some important information about the agent from the principal in the principal's designing of attractive incentives ('incentive compatibility constraints') (Milgrom and Roberts 1992).

Other features which cause difficulties include the following: the principal and the agent are both utility maximisers, the two parties' utilities are not necessarily the same; responsibility for the decision and implementation of the actions for the benefit of the principal are often delegated to the agent; and the agent and the principal select the alternatives based on their utility functions (Milgrom and Roberts 1992). Facing these features, the principal needs to sufficiently monitor the agent's performance in order to obtain the intended results from the incentive (Milgrom and Roberts 1992). High intensity of incentives cause variances in monitoring, consequently it requires raising the precision ('monitoring intensity principal'). This leads to raising the monitoring cost. If the variance in the precision is large, the intensity of incentives should be limited, because raising the precision requires high cost.

When the agent needs to conduct multiple tasks, his or her efforts concentrate mainly on the work monitored or on their individual work, but less on unmonitored tasks or tasks that are difficult to monitor, including teamwork (Lazear 1998; Milgrom and Roberts1992). As a result, the quality of output is often disregarded (Milgrom and Robert 1992). In order to avoid the negative effects, the marginal return of payment in each of the tasks should be the same ('equal compensation principal') (Milgrom and Roberts 1992), if the same performance on each task is desirable.

2.2.2 Work motivation

Despite the argument that incentives are important in changing the performance of the agent, the principal–agent theory does not elaborate on what motivates the agent, which is the object of incentives. However, in psychology, the motivation has been extensively studied and some of the studies seem to accommodate issues for identifying effective incentives in the health sector in LMICs. Particularly, they recognise that gaps exist between the outcome and the intention of incentives and present interpretations of the gap. They also recognise issues in the incentive environment such as issues of their working environment and non-financial incentives.

In psychology ‘worker motivation’ and ‘affect motivation’ are relevant to an individual’s psychological attitude towards work (Kanfer 1999). Worker motivation is more directly connected to performance than affect motivation which is generated by individual affect (feeling) (Locke 1976). Worker motivation largely depends on his or her cognitive expectation based on their estimated ability to achieve the organisational goals, the necessary efforts or resources to achieve the goal, and the return they can obtain (Franco et al. 2002). Higher worker motivation does not necessarily lead to higher performance by the employee or higher performance by the organisation the employee is working for. Also, achievement of objectives by the employee does not necessarily achieve the objectives of the organisation (Hunter and Schmidt 2000; Franco et al. 2002). Another psychological category relating to motivation is job satisfaction, which is sometimes used haphazardly in a ‘lay’ manner and has been defined as “a pleasurable or positive emotional state resulting from the appraisal of one’s job or job experience” (Locke 1976).

Herzberg's widely established theory classifies factors influencing motivation into motivating factors and dissatisfying factors ('hygiene factors'). The motivating factors originate from the work itself; the dissatisfying factors from the work environment include policies of organisations, salaries, working conditions, status, human relationships, job security and fringe benefits (Herzberg 1968). However, improvement in the dissatisfying factors is considered neither to satisfy nor motivate workers (‘hygiene factors’). Herzberg thus argues that motivating factors should be enhanced in order to raise worker motivation, by making the job itself more attractive to the employee (Cook et al. 1981).

There is another typology of motivation which does not specify the area where the

motivation raises or decreases but includes motivation pertaining to work. The typology divides motivation into intrinsic and extrinsic motivation. Intrinsic motivation "refers to doing something because it is inherently interesting or enjoyable", and extrinsic motivation, "refers to doing something because it leads to a separate outcome" (Ryan and Deci. 2000:55).

2.3 Incentive environment in the government health sector in LMICs

The prevailing incentive environment reflects the differential effects of incentives in both the public and private sectors. While the incentive environment in the health sector appears to have unique features which are different from that in the private sector, it shares common features with the public sectors (Allard et al. 2011; Chalkley and Malcomson 1998; Jack 2005; Biglaizer and Ma 2007; Delfgaauw 2007). However, the common features appear to be disadvantages in obtaining the intended incentive outcome. Furthermore, the health sector in LMICs seems to bear a double disadvantage. This is because in the sector, frequently dual practice, i.e., an income opportunity in the private sector, prevails and absorbs the labour supply of health workers, whereas weak government capacity appears less able to realise the intended incentive outcome against the dual practice.

2.3.1 Characteristics and issues

Incentives have been used routinely in the health sector (Chernichovsky and Bayulken 1995; Wibulpolprasert and Pengpaibon 2003; Eggleston 2005; Liu and Mills 2005; Dumont et al. 2008; Soeters and Griffiths 2003; Ir. et al. 2008). The health sector holds unique characteristics, some of which are shared with characteristics of the public sector (Dixit 2002; Besley and Ghatak 2003). Public sector employees also value financial incentives (Wright 2001). The valuing of financial incentives seems to be reasonable in the health sector of post-conflict fragile states or LMICs where efforts for daily survival are still imperative.

Government health workers' motivation was found to be similar to public sector employees' motivation (Wright 2001; Dixit 2002). Public sector employees' motivation is considered to contain factors which pertain to what the sector produces or embodies (Graham and Renwick 1972; Lawler 1971; Gabris and Simo 1995; Crewson 1997). These factors include unique types of utility, professionalism, and mission. The utility includes motivation to commit to the interest of the public (Perry 1996) and the fulfilment of employees' needs through their

work, which is connected to their serving the public and providing public goods (Graham and Renwick 1972, Lawler 1971). Professionalism is defined as the competence or skill expected of a professional (Oxford Dictionaries. on-line accessed on 20th November 2012). Professionalism is combined with career concerns which seek to obtain skills and experiences from the work and which functions as a promotional incentive in the public sector where strong incentives are lacking (Dixit 2002). Mission is defined as "a culture that is widely shared and warmly endorsed by operators and managers alike" (Wilson 1989, P. 95), unifies the organisation and defines its activities (Besley and Ghatak 2003). Besley and Ghatak (2003) argue that the mission of organisations in the public sector is much more important than in the private sector and works as a non-financial incentive. Studies about motivation of government health workers, but not about the effects of incentives, indicate a similarity to that of public sector employees (Wright 2001; Dixit 2002). However, Kohelar and Rainey (2008) argue that there is no difference in incentives, motivation and job satisfaction of workers between the public and private sectors (Kohelar and Rainey 2008)

The difficulties of monitoring health workers' performance is augmented by specific features of the health sector which are common to the public sector in general. These features include work which has multiple dimensions and a hierarchy of multiple principal-agent relationships in the sector. The multiple dimensions most likely accompany multiple tasks (Besley and Ghatak 2003), where a trade-off of some of the tasks is almost impossible (Dixit 2002). The issue of multiple principals originates from the fact that goods and services produced by the public sector inevitably involve the "non-excludability" of public goods, multiple stakeholders (Dixit 2002) and externality (Besley and Ghatak 2003).

Combining the two sets of multiplicity causes the free-rider problems over incentives. If a principal pays an incentive for a specific task among multiple tasks which complement each other, other principals do not need to pay incentives. The paid incentive is regarded as remuneration for all tasks. The incentive paid thus becomes a low-power incentive compared to its original purpose. If a task substitutes another task and each principal pays an incentive, each incentive becomes low powered in terms of motivating the agent (Besley and Ghatak 2003).

The incentive environment in the government health sector has additional complexities due to the sector's unique features and other settings. Information asymmetry disturbs the monitoring of performance, particularly concerning quality (McPake and Normand 2008).

Information asymmetry is intensified by the hierarchy of principal-agent relationships. It exists between patients and doctors (Scott and Vick 1998), doctors and managers of health facilities and health facilities and local health offices (Liu and Mills in Preker et al.2007). Health outcomes are influenced by many factors, and cannot be attributed to the performance of health workers alone. Patients do not have sufficient information to assess health service (McPake et al. 2002; Folland and Stano 2004).

The information asymmetry problem about monitoring deteriorates when monitoring for health workers' dual practice is necessary, as often it is the case in LMICs where dual practice is common. Further discussion about dual practice follows below.

In the prevailing multiple task setting, designing effective incentives is critical to achieving the desired outcome by increasing and directing efforts from workers towards a specific task (Hongoro and Normand 2006). However, the information asymmetry again poses difficulties in designing these incentives (Eggleston 2005; Dumont et al. 2008, 2007). Information asymmetry hides workers' preferences about incentives including the marginal returns, particularly in an environment where resentment exists among the workers about differences in their payments (Kingma 2003).

2.3.2 Incentives to health workers in LMICs

A range of financial and non-financial incentives have been applied to health workers in LMICs, some of which have been well known (Table 2.1). Some of them may function as motivating but others as 'hygiene' factors (Herzberg 1968). Financial and non-financial incentives are often combined. Combinations of the two types, however, do not necessarily obtain the intended objectives (Wibulpolprasert and Pengpaibon 2003). In the course of time both types are implemented whether or not there is an intentional connection between the two. "(T)rade-off" of effects between the two types of incentives needs further study in which the income levels of health workers are reflected (Ensor and Thompson 2006. P. 158). In addition to the organisational and the individual levels, team level incentives have been applied (Kingma 2003). Applications of incentives and their effect are greatly influenced by the overall incentive environment, although some studies of incentives, particularly financial incentives, appear to include less in depth investigations of this wider environment.

Table 2.1 : Types of incentives in the health sector

Financial incentives	Non-financial incentives
• salaries • reimbursement payments (subsidies, fee-for-service, price-cap, capitation, payments, payments paid for provisions of specific services - contracting, - bonuses, - performance-based payments - travel and hardship allowances - subsidized meals and other services for the individuals or their families (indirect financial incentives) (McPake et al. 2002; Chaix-Couturier et al. 2000)	- promotion - increases in work authority - training (domestic/abroad) and education, - prize and award - working environment(resource availability, environment in working facilities, management) - workload - conditions for working (working hours, holidays) - recognition and appreciation from superiors or the community where they work *Below are seen more often in LMICs than high income countries: - pension, - free health care, - insurance, - allowances (housing, education of children, severity of living rural or remote area) - per diem, - career development

Adopted from Hongoro and Nomarnd 2006.

(1) Financial incentives

It would be reasonable to conclude that the effect of financial incentives in LMICs are still ambiguous because of the limited number of studies which have been carried out and their mixed results. Also, empirical studies have rarely elaborated the impact of financial incentives in relation to health workers' other incomes, despite the likelihood of their earning income in the private sector: private practice income and/or their households' earning income from non-health related work.

The governments of LMICs seem to be unable to ensure the requirements for the design and operation of effective incentives. Studies of the effect of incentives have concentrated on specific issues, such as retention of health workers in rural areas. Also, themes or topics of study have been different from those in high income countries (Willis-Shattuk et al. 2008)

and mainly focus on the effects of incentives on the motivation of health staff (Stilwell et al. 2004; Dielemann et al. 2004; Agyepong et al. 2004; Manongi, R. et al. 2006). The incentives are more effective if they reflect cultural and social features of the incentive environment (Hongoro and Normand 2006).

Financial incentives for health workers are found in both high income countries and LMICs (Chernichovsky and Bayulken 1995; Eggleston 2005; Liu and Mills 2005; Dumont et al. 2008; Soeters and Griffiths 2003).

The incentives targeted at doctors have been the focus of most studies in health economics (Pauly and Gaynor 1990; Blomqvist 1991; Gaynor and Gertler 1995; Gruber and Owing 1996; Newhouse 1996; Barro and Beaulieu 2003).

Pursuing efficiency by setting appropriate incentives for doctors is widely regarded as an indispensable measure (Allard et al. 2011). Doctors, however, are often a minority in health cadres in LMICs (WHO 2006). Where incentives are targeted at other cadres in LMICs have been studied (Soeters and Griffiths 2003; Ir. et al. 2008), they have shown mixed results (Makas 2009; Ir et al. 2008; Meach 2006; WHO and MOH 2007; Thornton et al. 2009). Some studies have limitations due to the methodological difficulties in conducting randomized controlled trials, the lack of comparability of interventions, and the small size of the study populations (Chaix-Couturier et al. 2000).

Financial incentives have different objectives. The objectives are broadly categorised into controlling: quantity, quality, and cost of services. Some incentives are highly likely to bring a trade-off between quantitative or qualitative improvements. For example, if financial incentives are focused on increases in quantity of health services, the quantity of services is likely to increase but the quality is likely to decrease. However, sophisticated incentives which are sometimes a combination of financial incentives and regulations or rules for health service prices can mitigate the trade-off (Newhouse 1996; Ellis & McGuire 1986; Chalkely and Malcomson 1998). Appling such sophisticated combinations of incentives seems to be impossible in LMICs where the government and other institutional settings are undeveloped.

A short summary of the effects of various types of incentives is as follows:
Capitation may increase the number of referral cases (Allard et al.2011) and the number of registered patients but minimise the number of contacts with each patient and the service

intensity (Bennett 1997 in Bennett et al. 1997) of the health service (WHO 2006), and can be difficult for the principal to monitor.

An incentive which contains cost is prospective payment, i.e., fixed-payment, but it may sacrifice quality (Chalkely and Malcomson 1998). An incentive attached to a reduction of specific types of services, e.g., in managed-care organisations in the U. S., could reduce the cost (Grumbach et al. 1998; Hillmark). Salaries are paid at a predetermined rate for a specific time and not connected to performance (Liu and Mills 2007). However, salaries and global or prospective budget reduces the number of patients and that of the services provided (Bennett 1997 in Bennett et al. 1997).

It seemed to be reasonable that financial incentives aiming at increasing service quantity have been applied in LMICs and fragile states where the shortage of service delivery has been an urgent issue (Soeters and Griffiths 2003; Eichler et al. 2009; Allard et al.2011). Studies of the experiences of implementing these incentives have been few in number and in depth, though. However, applying financial incentives linked to the quantity of services seems to require greater caution in LMICs, because the incentives may overwhelm the quality. Also, this type of financial incentive often encourages health workers to provide unnecessary care which is "care medically not needed" such as "unnecessary outpatient visits, inpatient admission", "treatment" and "drugs" (Liu and Mills 1999, P. 409) and expensive services. This type of incentive included reimbursement such as fee-for-services, without limiting the cost.

Performance-based payments can either be connected to quantity or quality of health service delivery or health outcome (Eichler et al. 2009). However, studies of their effect have been limited in health economics (Liu and Mills 2007) and those in LMICs have been also similarly limited. The design of these payments possibly influences their effectiveness (Lagarde et al. 2010); for example, performance-based payments in a Rwandan case study improved both the quantity and the quality of services. In contrast, negative outcomes in other cases included false reporting of the quantity or 'cream-skimming' of patients who would quickly and/or easily recover, or avoiding severely ill patients (Lagarde et al. 2010: 32).

(2) Issues in raising effectiveness of financial incentives

Achieving high effectiveness of financial incentives requires the consideration of several factors. An optimal intensity of incentives induces the agent to make the maximum effort in

the interests of the principal, within the constraints originating from the setting (Milgrom and Roberts 1992). The optimal intensity is obtained by solving a maximisation problem (formula) with the following variables: 1) the effort of the agent which the principal wants to induce, 2) fixed payment to the agent, 3) the intensity of incentive, and 4) result of the risk-aversion of the agent regarding fluctuations of payments (Milgrom and Roberts 1992). In a maximization problem, each of these variables varies according to other variables in order to maximize the formula. A prerequisite for this maximisation problem is that the principal is able to change the fixed payment - more precisely, its proportion of the payment to the total payment (Milgrom and Roberts 1992). The risk-aversion strategy of the agent may be to select low payment with low risk. Therefore, the principal needs to bear the cost of imposing the risk on the agents and to reflect the risk in the financial incentive (Milgrom and Robert 1992). The risk is thereby a significant factor in the principal's decision to apply the payment mechanism.

In addition, the optimal intensity relies on the following four factors:1) "the incremental profits created by additional effort"; 2) "the precision with which the desired activities are assessed"; 3) "the agent's risk tolerance"; 4) "the agent's responsiveness to incentive" (Milgrom and Roberts 1992 p. 221). High precision in assessment, i.e, a high intensity of monitoring, is required by a high intensity of incentive, whereas incentives with a high intensity cause variances in monitoring ('monitoring intensity principal'). Raising the precision requires high cost. The third factor, the "risk tolerance" reflects the risk-aversion explained above. The fourth factor addresses constraints to agents' responsiveness. The responsiveness may be constrained by factors not originating from the agent but from other settings (e.g. negative working environment such as resource constraints in performing the task or no room for discretion in making efforts to achieve the incentive objective) (Milgrom and Roberts 1992).

Identifying and ensuring the four necessary factors seems to present difficulty in LMICs due to peculiar features of the health sector and of LMICs. Interpreting "the incremental profit" in the first factor could be difficult; the profit may be a health outcome or increase in health delivery (Folland and Stano 2004). From the second to the fourth factor, difficulties would occur in: monitoring quality, identifying what and who contribute to the health outcome or to the team work, obtaining sufficient information about the labour market, incomes of health workers and the working environment and arrangements affecting the responsiveness.

(3) Non-financial incentives

Non-financial incentives have been applied in the variety of forms and presented different effects and meaningful implications. However, studies about these non-financial incentives are limited in number and tended to be rather contextual, having the methodological difficulty of measuring changes in motivation (Bennett et al. 2001). Some non-financial incentives could be associated with the public sector's nature of serving the public and producing public goods (Graham and Renwick 1972, Lawler 1971; Shattuk et al. 2008). These incentives included support or appreciation or respect from their community, work load, relationships between their supervisors and staff, and appreciation shown by their mangers and colleagues (Al-Ma'aitah et al. 1999; Sararaks and Jamaluddin 2000; Ndiwane 1999; Dielman et al. 2003). Some non-financial incentives may be implemented only in LMICs or specific areas in high income countries where utility from these incentives is sufficiently attractive to health workers in the social and economic conditions, for example, housing allowance for health workers deployed to rural areas.

Non-financial incentives were found to be effective in the retention of health workers in a systematic review of studies into their motivation (Willis-Shattuk et al. 2008). Job security was appreciated by health workers (Ssengooba et al. 2006) and appeared to be a factor in retaining workers, which accorded relatively high job security in the public sector (Charmes 2002).

However, some of the non-financial incentives in Table 2.1 in LMICs are likely to be negatively correlated to motivating health workers. They often have been in negative or disadvantaged situations or status to raising their motivation. Rather, their situations are likely to reduce their motivation. For example, a poor working environment and shortage of drugs and materials disturb their performance. Weak management reduces the efficiency of performance. Allowances are constrained or lacking because of a shortage of financial resources (Shattuk et al. 2008; WHO 2006; Van Lerberghe et al. 2002; Gruen et al. 2002).

(4) Institutional arrangement and organisations

Mathauer and Carrin (2010) accommodated incentives and a number of other factors concerning the purchasing and delivering health services in relation to rules for the health financing, having founded on pragmatic experiences of incentives and the organisations involved. They presented a theory about the incentives resulting in effective purchasing and health services delivering. The theory included the context of the organisations where incentives were expected to function and the broader context of the organisations from which

they originated. Therefore, the theory is understood to concern factors influencing the incentive environment. The theory seemed to and be applicable to cases in LMCs, where the logical consequences they described seemed to occur frequently.

The theory explicated how arbitrariness functions for incentives and influences an organisation concerning whether it brings in the outcome expected by the incentives. They maintained that incentives and rules do not necessarily influence organisational practice because "the specific interests of organizations and individuals" influence the organisation practice. The interests of organisations and individuals are determined by "actual or potential benefits or disadvantages as perceived by organizations and individuals" in "the organizational and wider context" (Mathauer and Carrin 2010. P.10).

2.4 Contracting out in health sectors in LMICs

2.4.1 Theory of contracting out and applications

The contracting out of government services has been implemented with financial incentives, mostly to the contractors. In the U.K., in the mid-1990s, the approach of New Public Management (NPM) advocated increasing the efficiency of government through the market mechanism (Le Grand 2003); efficiency here "means that society is getting the maximum benefits from its scarce resources" (Mankiw 2002 p.5). Contracting out government service delivery is promoted by theories the NPM supports. The theories advocate the advantages of the private sector over the public sector (Mills 1997 in Mills and Bennett 1997). The market mechanism was extended to the health sector in LMICs soon after, through international cooperation (Palmer 2000; Mills 1997). Contracting out government services has been advocated by major international cooperation agencies, for example, the World Bank and the U.K. Department for International Development (DFID). Contracting in the health sector is defined as "a normal market exchange of services which is formalized in advance by the issuing of a contract binding the buyer and seller to the conditions of the exchange" (McPake and Hongoro 1995 P.14).

The mechanism of payment to the contractors varied and included a global budget based on capitation, fee-for-services, and performance-based payment (Liu et al. 2007). Payments to health workers within the contracting out have included performance-based payments (Soeters and Griffiths 2003; MOH 2007). However, studies of contracting out have centred less on the effects of these financial incentives and more on the outcomes for service delivery.

While the number of such studies have been limited, the effect of contracting out (Eichler et al. 2009; Liu et al. 2007) seemed to be ambiguous. Instead, studies found empirically and theoretically that contracting out faced issues pertaining to capacity of the government as the principal and those relating to the market (McPake and Hongoro 1995; Mills 1997)(Table 2.2).

Contracting out has been particularly promoted in countries where government service delivery capacity was judged to be rather low. Development agencies and organisations have supported contracting out projects within the context of broader support to state-building and increasing the effectiveness of development (DFID 2005a; Carlson et al. 2005; OECD 2008). This was particularly the case in those countries labelled fragile states. The World Bank defines 'fragile states' based on government capacity for achieving poverty reduction, sustainable development and effective use of international assistance (World Bank 2008). The World Bank definition does not generally include middle-income countries. The definition offered by DFID includes aspects of "state authority for safety and security"; "effective political power", "economic management" and "administrative capacity to deliver services" (DFID 2005a, p.8). DFID includes countries affected by conflict, e.g., Afghanistan, Nepal, the Democratic Republic of Congo and others, as fragile states (DFID 2009a). Cambodia is considered a fragile state, as it has demonstrated a "lack of regard for the rule of law" represented by "corruption" and has a state of "continued poverty and growing inequality" (Thornton et al.2009 P. v). The fragile states also include "collapsed states" and "(g)radually improving" states (DFID 2009a No page).

The issue of government capacity (McPake and Hongoro 1995) (Table 2.2) could be viewed as an important question when advocating contracting out in LMICs (Riddle 2005), because obtaining higher results from contracting may require a higher – or at least sufficient – level of management capacity from governments in LMICs than they possess. Also the augmented information asymmetry in the health sector exacerbates the difficulty of the issue. Most of the issues identified (Table 2.2) appear to be beyond sole capacity or control of most health authorities and governments in LMICs. Facing these issues, the health authority or government needs to manage different areas as the principal, e.g., designing incentives, monitoring the performance, and setting performance indicators (Eichler et al. 2009).

Table 2.2 Rationale for promoting and issues of contracting in the health sector in LMICs

Rationale for contracting (Broomberg 1994)	Issues of contracting
- Enhancement of provider competition, which leads to the improved technical efficiency[1] of the providers and allocative efficiency[2] within the health system - Increases in efficiency by increasing transparency in aspects of service delivery (price, quantities, and quality), and promoting managerial decentralization - Realization of benefits from contracting which, overall, surpasses the cost of contracting for establishing and maintaining the mechanism	<u>Relating to the government</u> - Government capacity to manage contracting (McPake and Hongoro 1995) - Less developed institutional setting (Hammer and Jack 2002) - Cost incurred for the entire process of contracting out, while governments of LMICs are budget-constrained (Mills 1997). <u>Relating to the market</u> - Potential shortage of providers, which does not foster provider competition (McPake and Hongoro 1995); - Potential unavailability of necessary capital for providers to compete for contracts (Broomberg 1994). The governments of LMICs are often budget- and capacity-constrained and difficult in arranging capital (Waldman et al. 2006); - Providers' opting out from 'price-competition' for 'non-price competition' focusing on service quality may disturb perfect market competition and increase the contracting budget or squeeze budgets for non-targeted services (Broomberg 1994). - The possibility that the government may have to bear any additional costs, most likely transaction costs which may exceed the actual benefit (Palmer 2000).

Note: Technical efficiency[1] is defined as producing maximum possible output with "a given quantity of inputs, or a given output is achieved with minimum inputs", indicating that the production "is operating on the production possibility frontier" (Mills 1995. P.3). It is a contributing factor to economic efficiency (Bitran 1992). Allocative efficiency[2] is defined as the production of the maximum social value of health services at minimum cost (Liu et al. 2004).

Contracting out has been implemented, for example, in Afghanistan (Strong et al. 2005), Cambodia (Soeters and Griffiths 2003), Haiti and Uganda (Eichler et al. 2009). The services

contracted out were both clinical and non-clinical and a specific group of services or a package of services provided at levels of health facilities or offices (Mills 1997, Liu et al. 2007). The cases cited above were contracted out mostly to the non-profit sector, mainly NGOs. A common definition of NGOs has not been established, due to their diversity in, e.g., size, place of origin, structure, work sectors, religious affiliations (Lewis and Wallace 2000; Lewis 2001). Some studies argue that NGOs were more effective and efficient in service delivery than governments or bilateral and multilateral donor agencies in LMICs (Gilson et al. 1997; Lewis 2001; Loevinsohn and Harding 2005).

2.4.2 Performance-based payments in contracting out

Performance-based payments have been applied to health workers in contracting out (Soeters and Griffiths 2003; MOH 2007), however the majority of past applications was to the contractors. The principal-agent relation in contracting out is explained by standard agency theory; therefore, the central issue in increasing effectiveness of contracting out is the design of effective incentives which induce the agent to promote the principal's interest. The agent can opportunistically maximize his or her utilities and avoid efforts to maximize the principal's utility by taking advantage of the limited information held by the principal ('information asymmetry'). However, designing effective incentives face constraints caused again by information asymmetry (Milgrom and Roberts 1992). Monitoring of the agent's behaviour by the principal is among the strategies for preventing the agent's opportunistic behaviour (Milgrom and Roberts 1992; MacDonald 1984; Milgrom and Roberts 1992; Preker et al. 2000).

Studies of payments to the contractors found that issues of applying the payment which obtains desirable outcomes seem to be similar issues to those associated with applying other types of incentives in LMICs. The issues were mainly issues of management capacity of the health authority or the NGO contractors (Liu and Mills 2007) as well as the ability of the government to continue to pay them (Wibulpolprasert and Hempisut 2004). Here again, factors other than the payment itself, seemed to be the main focus of the studies.

Performance-based payments to the contractors were mostly connected to: quantity (output) of services; cost (per capita in the catchment area); access of the poor to health services; collection and analyses of health management information statistics; motivation of project health staff, especially output of services have been frequently connected (Eichler et al. 2007; Schwartz and Bhushan 2005; Arur et al. 2010; Soeters and Griffiths 2003; Strong et al. 2005; Riddle 2005; SRC 2006; MOH 2007b).

The quantitative (output) changes in services were counted almost in the number of provided cases of services. The contracting out project in Afghanistan, for example, counted the number of female patients who received services (Arur et al. 2010). Connecting this figure to the number of hours worked in the government sector was rarely seen in available literature. This suggests that either an accurate monitoring of hours worked was challenging for various studies (Di Tella and Savedoff 2001; Alcázar and Andrade 2001) or that an increasing of service outputs was prioritised. Monitoring is likely to involve a focus on workers' absenteeism, about which relevant actors have diverse interests in the hierarchy of agent-principal relationship. The interests are likely to disturb monitoring, augmenting the information asymmetry (Alcázar and Andrade 2001).

Studies of the effect of performance-based payments to the contractor in contracting out have been less in depth in health economics (Liu and Mills 2007). The economic impact of the payments on the health workers' income has rarely been investigated. Whether the payments are sufficient to change behaviours of the workers has not been comprehensively studied. An evaluation of a Cambodian contracting case within the government structure investigated the impact (Keller et al. 2008); however, it did not investigate the impact in the major cadres of health workers in rural areas.

Performance-based payments were evaluated in relation to achievements of indicators attached to them, mainly by comparing the indicators in the contracting projects with those made by the government service or non-contractor NGOs (Loevinsohn and Harding 2004; Eichler et al. 2001), i.e., the quasi-experimental cross sectional study design. Other evaluations compared the indicators before and after project implementation (Soeters and Griffiths 2003; Strong et al. 2005; Arur et al. 2010). However, changes in the labour supply of health workers were seldom evaluated with sufficient data or description or reflecting the settings.

2.5 Dual practice

2.5.1 Consequences, factors which bring about dual practice

Motivation influenced by incentives does not necessarily result in a rise in performance; instead, it sometimes leads to negative behaviour such as cheating or dual job-holding. Low salaries in the government sector and high salaries in the private sector, as seen in some LMICs (Akashi et al. 2002), could motivate health workers to conduct dual practice. Dual

practice can be regarded as a significant factor in the incentive environment in LMICs. It absorbs health workers' labour supply. Dual practice has been prevalent in LMICs (WHO 2006), affecting quantity, quality and labour supply of health services (Garacía-Praco & González 2007; Ferrinho et al. 2004; Jan et al. 2005), despite the fact that many health workers often earn a higher income than other types of government officials or the general public (Witter et al. 2007; Koot and Martineau 2005; Das Gupta et al. 2008 cited in McCoy et al. 2008). Dual practice has been studied with a focus on its negative consequences. However, studies appear to be limited in number and scope, when compared with those in high income countries.

An individual, as a utility maximiser, often conducts dual practice (Newman 2012), if the combination of leisure and income from the first job is not the most preferable combination (Berman and Cuizon 2004). The individual adjusts the allocation of hours amongst the first and second jobs (working hours) and leisure within limited working hours a day, after extracting leisure time from the 24 hour day. The wage of each job is higher than the employee's reservation wage (Berman and Cuizon 2004), which refers to the lowest wage the employee will accept (Mankiw 2011). Leisure time means any time other than that which the individual spends working to earn income; but does not necessarily mean free time. The hourly wage for the first and second jobs are often different.

Even if the individual earns a lower hourly wage from the second job than the first job, the individual will still take the second job, and the total labour supply of the individual increases, while the individual is working as much as possible in the first job (Perlman 1966; Marby 1973; Shisko & Rostker 1976). The secondary job is still placed as "contingent" or "complementary" to the first job because its income contains "unacceptable uncertainty" to risk-aversion for some individuals (Shisko and Rostker 1976. P.299).

When the increases in the marginal utility of their first job are lower than that from the secondary job, leisure and other activities, workers substitute the secondary job, leisure and other activities for the first job (Moses 1962 cited in Berman and Cuizon 2004; Perlman 1966; Shishko and Rostker 1976). This explicates the dual practice in LMICs caused by low and fixed government salaries.

Relations between wage rates and hours allocated in the first and the second jobs are as follows:

Hours worked in the secondary job are positively correlated with wage rates of the secondary job.
Hours worked in the secondary job are negatively correlated with the earnings from the first job which resulted either by increases in the wage rate or in hours worked.
Increase in family size is positively related to the hours worked on the secondary job (Shishko and Rostker 1976).

Dual practice is also explicated by a modified utility-maximiser model. However, this model seems to be less persuasive than the utility-maximiser model in LMCIs where government salaries are often below their necessary living cost (Ensor and Witter 2001; Jumpa, 2007; Jan et al., 2005; WHO 2000). A modified utility model emphases doctors' altruism, which is satisfied more in their private practice than in government services, e.g., improvement of patients' health problems. Another model stresses opportunities for skills development in the private sector (Jumpa et al. 2007; Humphrey & Russel.2004). Differences in management between the two sectors resulted in dual practice (Allard et al. 2011; Chalkley and Malcomson 1998; Jack 2005; Biglaizer and Ma, 2007; Delfgaauw 2007).

Bad management in the government services, in both materialistic and non-materialistic respects, hinders service delivery and frustrates the health workers (Jamal et al. 1998; Van Lerberghe et al. 2002; WHO 2006; Berman and Cuison 2004). This explanation might also be applicable to health workers in LMICs (Socha and Beck 2011). In the private services doctors may have more autonomy in their choices of medical treatments or of time spent on a case than in the government service (Jumpa et al. 2007; Humphrey & Russel 2004). Other health cadres might experience the same.

In high income countries, dual practice frequently causes self-referral of patients to a private practice (Eggleston and Bir 2003) where patients with severe illness might be avoided due to the unacceptable cost of treatment (Martinussen & Hagen 2009; McGuire & Hughes 2003; Ellis 1998; Newhouse 1996), and 'cream-skimming' of the patients who could pay higher fees for private services (González 2005). In LMICs, practices harmful to patients and resource diversification from the government to the private sector are both major problems (WHO 2000 and 2006; Narasimhan et al. 2004, Akashi et al. 2004; Gruen et al. 2002; Jan et al. 2005; Ferrinho et al. 2004, Ensor and Thompson 2006, Garacía-Praco & González 2007).

A positive argument for dual practice maintains that social welfare is increased by dual

practice for some patients who are referred to the private services (Biglaiser and Ma 2007). These might be patients who are able to afford the service, or the services may be paid by the public sector; however they are unlikely to be the majority in LMICs.

2.5.2 Dual practice as corruption

Doctors' conducting private practice at a public facility during their office hours and absenteeism are both viewed as illegal activities by the theory of corruption (Di Tella and Savedoff2001). Though the theory does not specify the reasons for absenteeism, they are highly likely to include dual practice outside of the facility. These activities or cheating or shirking or collusions are attributed partly to the multiple principal-agent relationships and the information asymmetry in the health sector (Di Tella and Savedoff. 2001; Milogrom and Roberts 1992).

If dual practice is prohibited, the decision to conduct or not conduct it depends the probability of being detected and punished, and the consequent income through by job. If the probability is low, dual practice is not restrained (Di Tella and Savedoff 2001). These factors constitute the incentive environment in the health sector. The importance of the probability implies that prohibition or restriction of dual practice is a significant challenge to LMICs, due both to their low capacity of monitoring and to their weak regulatory setting. In some LMICs, a corrupt health authority may be an issue (Ensor 2004). Furthermore, in practice, corruption is influenced by numerous factors beyond the boundary of the health sector (Ensor and Thompson 2006).

The probability of being detected and punished changes the relative value of the government wage and the grand total of 1) the total income from the government and corrupt activity multiplied by the probability of detection and punishment and 2) the difference in income resulting from the punishment (Ensor and Thompson 2006). This is expressed by

$$E(Y) = (1-p)(CB + Wg) + \{W_p\_ f\} \gtrless W_g$$

Where
P is the probability of corruption of being found by the authority and punished.
CB is income from on corrupt activities resulted from multiplying the number of activities by the income-level from each corrupt activity.
W_g is government wage
W_p is alternative income earned from alternative job in the private sector or government sector to the present job if the unofficial activity lose

f is the value of punishments on the activities put on when they are caught .

Increasing the government wage has only a limited effect on restraining the health worker from corrupt activities (Di Tella and Savedoff. 2001). In contrast, Rijckeghem and Weber (1997) maintain that the corruption is mitigated in LMICs, if the government workers receive remuneration above their fare-wage. The fare-wage is "what the employee's efforts deserve"(s) (Akerlof and Yellen 1990. p.256) and is determined by factors such as, for example, their market clearing wage (the equilibrium wage in market), civil servant status, and money required for subsistence (Rijckeghem and Weber 1997). This hypothesis may be associated with the modified utility model of health workers (Ensor and Thompson 2006).

2.5.3 Labour supply of health workers between the two sectors

The effects of dual practice on the labour supply of government health workers have not been sufficiently addressed by empirical studies (Socha and Beck 2011). Also, there have been few empirical studies in LMICs which addressed dual practice, even indirectly. One study investigated health workers' working hours in the private sector and intention to change labour supply in Cambodia under assumptions that their government payments were increased (MOH 2005). Brekke and Søgard (2007) taking the setting of the UK National Health Service as theoretical conditions, maintain that dual practice reduces quantity of services in the mixed provision of public and private services; however, their study was not empirical.

Empirical studies note that benefits obtainable by health workers from being in the government sector in LMICs increase profit in their private practice and contribute to retaining them in the government sector (González 2004; Ensor and Thompson 2006). The reputation as good doctors in the government service, or even the fact that they are working in the government service attracts patients and as a result increases income in their private practice.

Also, the ability to shirk government work and conduct dual practice, i.e., coordinating their labour supply easily according to their preference, is counted as a factor in retaining health workers in the government sector (González 2004). This would seem to reflect the weak institutional arrangement. Though evidence for this has been limited (Berman Cuizon 2004; Ensor and Thompson 2006).

2.5.4 Financial incentives to reduce or stop dual practice

Reducing dual practice by financial incentives has been attempted in LMICs; however, their effect has been insufficiently studied (Prakongsai 2005). An Indonesian case which applied modified performance-based payments (rather similar to promotion) proved unsuccessful, mainly because the payments were lower than income from private practice (Chernichovsky and Bayulken 1995). Instead, an allowance is potentially effective in a specific condition. This condition is where health workers work a total of eight hours a day and the hourly wage in private practice differs in profitability according to hours worked after the opening hour (diminishing marginal wage). The allowance is understood as sufficient, if it equals the highest hourly wage in their private practice. It should not equal the amount of the highest hourly wage multiplied by eight (hours) (McPake and Normand. 2008).

2.6 Exploring the impact of performance-based payments in LMICs

The optimal effective financial incentive reflects other payments to the worker (Milgrom and Roberts 1992). This implies that designing performance-based payments for government health workers in LMICs requires them to reflect other payments, i.e, income. In other words, exploration of the impact of financial incentives requires the inclusion of other incomes paid to the health workers as seen, for example, in Ensor et al. (2009); where they obtained payments both in the public (government salaries and others) and private sectors (dual practice or work in non-health sectors) (WHO 2006; Asiimwe et al. 1997; Das Gupta 2003, Ensor et al. 2009). These incomes constitute the incentive environment and are likely to influence the impact of performance-based payments. However, some of these incomes remains excluded from studies which argue for the positive impact of payments.

2.6.1 Incomes health workers in the government and private sectors

Health workers obtain income from different sources; one of the sources is apparently the government sector. This is the core income to be investigated in studying the impact of performance-based payment, since it includes the payments and is indicative of the importance of this income to their total income and to their households' total income. It also indicates the extent to which they spend their labour supply in the government sector. For, example, the incomes in this category earned by Indonesian rural midwives reached only about one third of their total income because the midwives earned income from both private practice and non-health work (Ensor et al. 2009).

The income in the government sector in LMICs includes not only government salaries but also supplemental salaries from NGOs or other development aid organisations or per-diems in LMICs (Ensor et al. 2009. Jacobs et al. 2010). This category of payments seems to be one of the core sources of income and may compete with income from dual practice or economic activities such as agriculture. Health workers' receiving this category of payments implies the multi-task setting and the setting may affect the labour supply of health workers in the incentive environment of the multiple-task setting with the multiple principal-agent relationship. Supplementary salaries from the Global Fund, for example, were blamed for drawing the labour supply of health workers (Biesma et al. 2009) away from activities less connected, or not-connected, to the Global Fund salaries, and towards activities to which the Global Fund salaries were connected (Biesma et al. 2009). Per-diems are so attractive to the workers as an additional source of income that they are frequently absent from government facilities in order to attend training days or workshops (Smith 2003).

Government health workers who receive performance-based payments are also highly likely to still receive government fixed salaries. Therefore, it would be reasonable to include government salaries in the exploration of incentive impact.

Private practice income of government health workers may compete against performance-based payments for the labour supply of health workers and disturb the effectiveness of the payments. Previous studies and reports have concentrated on the private practice income of doctors who could be regarded as minorities in rural areas in most LMICs. They included insufficient analyses for exploring the impact of performance-based payments. Some have limited or minimal descriptions of the methods of data collection (Ferrinho et al. 2004).

The amount and proportion of doctors' income from private practice was studied almost exclusively in relation to their total income (Ferrinho et al. 2004; Macq et al. 2001). Macq et al. (2001) found that doctors' private practice gave them between 0.6 and 10 times the hourly income of their government work (calculated in the purchasing power parity) across the 37 countries (N=138) (Macq et al. 2001). It is difficult to interpret these variances because information about the doctors' other incomes and the economic status of their households received little attention in their study. Another study by Ferrinho et al. (1998), mentioned above, found that the private practice income of doctors in urban areas in African countries reached 65% (the median) of their total income (N=65).

The study by Ensor et al. (2009) mentioned above investigated Indonesian midwives' income from private practice and from non-health work. The private practice income reached two-thirds of their total income (Ensor et al. 2009). This study comprehensively investigated determinants and interactions of incomes from the private and from the public sector (government salaries, per-diem and income from non-health work). Factors explored for the determinants of private practice incomes were, for example, poverty-related data at the sub-district level and the population for the economic status and size of the area where the midwives were working or, years of their working for the quality of services, and the distance from the nearest hospital for health service market conditions. Applications of these variables were based on a hypothesis that the private practice income was likely to primarily rely on the amount and the price of service delivered, and these two types of factors were translated into these proxies. It found that the private practice income was most closely related to the quality (translated into midwives' years of experiences) and less closely to the distance from the nearest district hospital (Ensor et al. 2009).

The Cambodian MOH investigated the significance of income from private practice earned by health workers to their government salaries (MOH2005) and asked how much income their health workers wished to receive ('willingness to accept') from the government in consideration of their time allocation in dual practice. The findings of this study are further elaborated in Chapter 6. Health workers who were the subject for this study largely (84%) consisted of those who belonged to the highest two government employment grades (MOH2005). The two grades were less seen in health workers in rural area, i.e., doctors, dentists, pharmacists and assistant doctors (MOH 2005). The income from private practice was, at maximum, around 15 times higher than the government salaries of specialist doctors. Health workers with higher qualifications and skills would require nearly 15 times their current government salary, if they totally gave up dual practice (MOH 2005). However, they would require nearly 6 times their government salary, if they were still to conduct dual practice but work for 8 hours per day in the government sector (MOH 2005).

2.6.2 Health workers' household income

It is reasonable to consider that health workers' household income influences the impact of performance-based payment, given the quoted low government salaries (Akashi et. al. 2004; Ensor and Witter 2001) and a peculiar feature of LMICs as described below. Nevertheless, health workers' household income was included by only a limited number of studies (McPake et al. 1996; Das Gupta 2003; Ensor et al. 2009).

Household members put their own income into the budget of the household as an economic unit which seeks to maximize profit with limited budget (the unitary model, explicated below) (Samuelson 1956 cited in Lundberg and Pollak 1993). The household as a unit of consumption is expressed by the following.

$$\sum_{i=t}^{n} pix\, i \leq m,$$

where i is kinds of goods (i=1…n), pi is price of i, $x\ i$ is consumption of i, and m represents income.

A household is defined as the state of dwelling together, by covering living costs from one source, including food costs, and pooling funds (Deaton 1997).

There are two models for household economy. The unitary model is one of two contending models of household economy. Another is the collective model. The unitary model seems to be more suitable for exploring the impact of performance-based payments in LMICs. This is because the model considers the household as a unitary profit-maximiser-economic unit (a consumption unit) which pools all incomes of household members and which behaves to maximize a single utility function (Samuelson 1956 cited in Lundberg and Pollak 1993). This feature fits the households in LMICs, which frequently has more than one breadwinners and different income sources but combines these incomes together in the household budget. Another feature of the unitary model is that an altruistic member of a household makes resource allocation of the household in a way that maximises the single utility function with budget constraint. The altruist concerns oneself about the welfare of other household members, even including those who are completely selfish (Becker 1974 and 1981 cited in Lumberg and Pollak 1993). This feature is somewhat different from the conventional theory of rational consumer behaviour which maximizes his/her own utility.

The collective model assumes that households are collective entities of individuals and that the allocation (the decision) of the individuals is at Pareto Efficiency (Donni 2004). The distribution is attributed to, for example, status, age, gender (Donni 2004; Hoddinott and Haddad 1995), the power of negotiation among the household members (Basu 2006) or the rank of wives in polygamy (Mammen 2004). Therefore, this model has less relevance to

measuring the impact of financial incentive to the household economy as a unit not the distribution inside the household.

This household's obtaining different incomes as a consumption seems to strengthen in LMICs, particularly in low income countries. Their economies depend largely on primary industry (agriculture or fishery or forestry). Health workers and their household in rural areas diversify income sources within and outside the primary industry in order to avoid shocks and risks which severely affect the household economy (Dercon, S. 2002; Barretta, C. B. et al. 2001; Bryceson , D. F. 1999). Incomes from these diverse sources may intricately influence each other and may induce other income to increase or decrease. Government health workers and their households in LMICs conduct other jobs in other sectors, e.g., agriculture (Asiimwe et al. 1997). This environment reasonably indicates that investigating the impact of health worker incentives on their household income is important, given the diversities of income sources of households in LMICs and the household as an economic unit. Within the total household income in LMICs, the degree to which a health workers' income has important implications depends on its significance to the total household income.

Nevertheless, the implications of the non-health income of health workers, as well as the incentive impact, on the household income have received only limited study. Studies in Uganda (McPake et al. 1996), Nigeria (Das Gupta 2003), Indonesia (Ensor et al. 2009), and Burkina Faso, Ghana, Indonesia (Ensor no date) did include such income. The Burkina Faso case indicated a high importance of midwives' income to their overall household income. The Indonesian midwives were breadwinners (Ensor no date). Therefore, their income and changes in their income were highly important to the households. This also implies that the proportion of financial incentive to health workers' total household income is a crucial factor when studying the impact of incentives.

2.6.3 Household Expenditure

It is reasonably important to investigate the impact of payment in relation to health workers' and their households' income, considering the household as an economic unit. However, there have been widely recognised difficulties in obtaining accurate information about income, since incomes may be under-reported (Deaton 1997). Obtaining the household expenditure data contributes to exploring and increasing the accuracy of household income, because the expenditure is the function of the household income. More accurate assessments of incomes would contribute to exploring the impact of performance-based payment. Also, some types of household expenditure, or the structure of total household expenditure,

indicate the economic status, e.g. a higher proportion of food or non-food expenditure to total household expenditure (The Engel's Law. Mankew 2009). However, applying the advantage of being able to determine household expenditure has been excluded from most explorations of the impact of performance based payments.

Empirically collected household expenditure data establishes and compares the economic status among households and between groups of households (not specifically health workers'). Nationwide household surveys collected a large number of samples at the national level in LMICs. One conventional survey framework is the Living Standard Measurement Surveys (LSMS) program by the World Bank which has conducted 70 household surveys in more than 40 countries (World Bank 2010).

2.7 Knowledge gap about impact of performance-based payments in contracting out in LMICs

Performance-based payments to government health workers were applied in contracting out government health services in the public sector in LMICs because they were thought to be effective in increasing service delivery. However, as seen above, there have been knowledge gaps about the impact of performance-based payments on government health workers and their households. The impact of payments, i.e., the importance of the payments to the income has been little studied; whether the payment significantly increases the health workers' income, what proportion the payments represented of their total income and, as a result, what proportional income changes were realized in their total income and their household income.

The impact has not been studied, despite the impact of payments being a core concern in changing the health workers' labour supply in the government sector, consequently for the increase in service delivery. Namely, it was highly likely that performance-based payments paid to the health workers in the Cambodian contracting out project sufficiently increased their total individual income and total household incomes. Consequently, it was highly likely that proportional changes of incomes in the government and the private sectors occurred to their total household income. Therefore, as an outcome of these changes, increases in labour supply in the government sector and transfer between the two sectors were likely to be realised.

The incentive environment is largely influenced by the characteristics of the public sector, private practice income, and dual practice regulation; however, these factors have received

little attention in the studies which argued for the payments. The payment mechanism at the NGO contractor level has nearly lacked study, therefore, information about it should help to better understand its impact and the factors influencing the incentive environment.

2.7.1 Incentive environment

In order to promote health workers' efforts to increase government health service delivery, applying performance-based payments is highly likely to be necessary. While both theory and experiences indicated that financial incentives were preferred and applied to the health workers in the government sector, the special characters of the public sector incentive environment: multi-task and multiple principal-agent relationships have possibility of influencing the effect of the incentive. The effect may be influenced also by the payment mechanism. In the case of DIFD/World Bank Contracting project, the effect may be influenced by the implementation methods of the contracting project by NGO, in addition to the factors above. Investigations of these factors are expected to contribute to better understanding of the effect of incentives. However, such investigations have not been studied in depth.

Institutional issues, some of which seem to be embedded in the health sector, are highly likely to create difficulties in the incentives' achieving the intended results in LMICs and the fragile states. The issues seem to be connected with the weak government capacity in terms of service delivery and managing the contacting out (McPake and Normand 2008), and a similar weak capacity in restraining government employees' corruptive activities including in private practice (Ensor and Thompson 2006).

Weak dual practice regulations seemed to encourage dual practice. Also, NGOs might have enhanced countermeasures to the dual practice in order for the NGOs to achieve the objectives of the contracting project. Consequently, changes in the health workers' dual practice might have occurred.

2.7.2 Health workers' different income, their households' income and expenditures

The health workers working for a contracting out project in LMICs are highly likely to obtain income from different sources. These incomes are highly likely to include their government salaries, supplementary salaries and per-diems, other than income from private practice. However, the government salaries are often below the level which affords a decent life (Ensor and Witter 2001; Jumpa 2007; Jan et al. 2005; WHO 2000), encouraging private

practice or resignation from government work in LMICs (Chernichovsky and Bayulken 1995; Akashi et al. 2004; Soeters and Griffiths 2003; Witter et al. 2007; Zambia Ministry of Health, Zambia 2007 quoted in McCoy et al. 2008). These payments and/or the total income may have impacted the effectiveness of performance-based payments.

The income from private practice is likely to be significant to total income of the health worker. It may compete against performance-based payments in the contracting out setting with regard to health workers' decisions in allocating their labour supply between government and private sectors. However, the income from private practice and its implication have largely been absent from previous studies (Dieleman et al. 2003; Chen et al. 2004; Stringhini et al. 2009; Jacobs et al. 2010; ADB 2001, Soeters and Griffithes 2003; SRC 2006; MOH 2007; Jacobs et al. 2010).

Also, as discussed above, income from non-health work in the private sector, including income obtained by other members of health workers' households, have received little consideration in previous studies.

Investigating some types of household expenditure or the proportional structure of expenditure item in the total household expenditure is expected to indicate the economic status of the health workers' households. The economic status is most likely influenced by the financial incentives and private practice income.

Data on their household expenditures increases the accuracy of the assessment of the income of health workers and their households. However, investigataions of household expenditures have been little applied to exploring the impact on performance-based payments in LMICs.

Chapter 3 Cambodia - the context of contracting out and past contracting projects

This chapter provides an outline of Cambodia's history, following its liberation from French colonial control, focusing mainly on the political and socio-economic developments which were highly influential to health development. It then describes the development and current state of the health system which has had to face various issues. The chapter concludes with a description of the cases of contracting out of government health services to NGOs in Cambodia in which performance-based payments were paid. The payments were evaluated highly as they contributed to increasing health service delivery.

3.1 Post colonial history of Cambodia

3.1.1 Genocide, conflicts and political instability

The history of Cambodia, after almost a century of colonial rule by France, has been coloured by conflicts from both outside and within the country. During these years, the name of the country and political system were changed - often by those whose motives were self-interest and power, while the life of the people, particularly the poor, changed very little. The country remained under-developed. These tragic incidents have degraded the health status of the population and disturbed the development of the health sector.

The war in Vietnam negatively affected Cambodia physically, politically, ideologically, and socially. During the war, the American invasion and air-attacks in Cambodia resulted in destruction, injuries and deaths (Shawcross 1987).

Between 1975 and 1979, the Khmer Rouge regime ruled and devastated Cambodia (renaming it Democratic Kampuchea). The genocide carried out by the Khmer Rouge has been estimated to have killed 1.7 million people, either directly or indirectly through resulting famine, disease or displacement (Hinton 2004). The regime destroyed specific groups of the population: by generation, gender, social class – e.g. young males (Walgue 2006) or the intellectual class which included medical staff and teachers. A large number of refugees from the genocide and displacement sheltered in camps along the Thai-Cambodian border or in Thailand (Blunt and Turner 2005). The regime destroyed almost all the infrastructure of the country: physical, social, and production, i.e., the foundations of the development of the country, social norms, culture, and traditions (Gottesman 2002). The regime has had a lasting negative effect on many aspects of the country, including a legacy of trauma and psychiatric diseases among the population.

The Khmer Rouge regime was displaced in 1979 by the Vietnamese. The People's Republic of Cambodia was established in 1979, supported by the Vietnamese. However, the Khmer Rouge, which had been backed by China, the United States, and other anti-communist neighbouring countries such as Thailand, maintained its military power and even continued to control some areas, conducting repeated attacks and insurgencies against the government. The Khmer Rouge-led conflicts against different Cambodian regimes lasted for over a decade, even into the 1990s, and cost the lives of many Cambodians and disturbed the development of the country.

During the era of the People's Republic of Cambodia, Cambodia belonged to the Soviet Bloc, having the U.S.S.R. and Vietnam as its allies. Due to this situation, the government of Cambodia could not get official United Nations recognition as a state; instead, the Khmer Rouge held official government status. Also, during this period, aid from the so-called Western Block and even from the United Nations was limited. Thus, aid was provided only by the Soviet Bloc, Vietnam, and UNICEF.

In the late 1980s, the withdrawal of the Vietnamese, the collapse of the U.S.S.R. and the subsequent dissolution of the Soviet bloc led Cambodia to abandon communism. In 1989 Cambodia was again renamed, this time as the State of Cambodia, under the leadership of Hun Sen, who became Prime Minister. However, political and military turmoil continued, with further involvement of the royal family of Cambodia, which aimed to restore the monarchy by collaborating with different interest groups, including the Khmer Rouge, as well as some foreign powers.

The Paris Peace Accord in 1991, resulted in the establishment of the United Nations Transitional Authority in Cambodia (UNTAC) in 1992-1993. The first national election was held in 1992, with the royalist party, FUNCINPEC victorious.; However, the governing party, the Cambodian People's Party (CPP) led by Hun Sen, the current prime minister, persisted in power. As a result, CPP and FUNCINPEC formed a distorted two-party government and the country was re-established as a constitutional monarchy (the Kingdom of Cambodia). The coalition government was, in fact, not a coalition government as is commonly understood. For example, there were two prime ministers; the first prime minister's seat was allocated to the leader of the FUNCINPEC and the second seat to the CPP's leader, Hun Sen. This situation deepened the already existing political divide in the country (Hendrickson 1998).

The coalition sustained only a brief superficial peace. In 1997 CPP-led violence raged in the capital and prominent figures of the FUNCINPEC were expelled or killed. These incidents contributed largely to the victory of the CPP in the subsequent national election in 1998, and made Hun Sen the prime minister. Since this election, the CPP has continuously expanded its political power (Hughes 2009).

The establishment of a new government in 1993 led to a rapid increase of donor support. International cooperation was eighteen times larger than it had been in 1989, four years earlier (Lanjouw et al. 1999). These flows resulted not only in visible changes in the country, but also in high inflation. However, substantial results from this international cooperation were not achieved until the late 1990s (Andersen 2004; Sedara and Öjendal 2009). It was recognized that government decentralisation and administrative reform were necessary in the rebuilding and development of Cambodia, together with increasing good governance (World Bank 1992; UNDP 1995; ADB 1999; Blunt and Turner 2005), as seen in other LMICs (Grindle and Thomas 1989).

3.1.2 The Economy, poverty, and corruption

The years spent under the Khmer Rouge regime and the international embargo of the government of the People's Republic of Cambodia collapsed the Cambodian economy. However, the inflow of a large volume of aid money after 1993, combined with the economic growth of neighbouring countries, led to an average growth rate of the Gross Domestic Product (GDP) in Cambodia of 8.52 % from 1994 to 2004 (World Bank 2007 P ii, calculated from Figure 1). Despite this, the country has not developed industries which have competitive advantages over other countries. Only the garment industry, in which Cambodia's cheap labour has been the only advantage, has been developed by foreign investment without significant additional investment in terms of both capital and human resources (UNDP 2011).

However, development of primary industry, such as agriculture, forestry, fishery, and husbandry, on which the poor depend, has lagged behind, and has hindered their emancipation from poverty. In the poor rural areas in Cambodia, 70% of the labour force was engaged in primary industry; however, their average annual growth rate was 3.4% from 1994 to 2004 (World Bank 2007). The growth rate was lower than those of neighbouring countries which were at a similar stage of economic development, in the same period (World Bank 2007).

The GNP per capita was US$270.00 adjusted by the purchasing power parity (PPP), in 1995 (World Bank 1997) (GNP values hereafter were adjusted by the PPP). The country was ranked 21st from the bottom among 133 countries (World Bank 1997), being much lower than the Philippines' US$1,050.00 and Thailand's US$2,740.00 and positioned between the Vietnam's US$240.00 and the Laos People's Democratic Republic's US$350.00 (World Bank 1997). In the early and mid-1990s almost half of the population was destitute; their economic status was below the consumption poverty line (World Bank. 2006). From 1994 to 2004, despite the fact that poverty was reduced by almost a quarter, disparity in wealth increased, particularly in rural areas; the Gini coefficient, which indicates income disparities, rose from 0.35 to 0.40 nationally (World Bank 2007).

Alongside rapid economic growth, corruption has been widespread in the Cambodian public system, from the highest to the lowest levels, and in society generally. It even exists between students and teachers in relation to getting sufficient grades or qualifications (UNICEF 2005; Akashi et al. 2004). The widespread corruption has been viewed by donors, NGOs, investors, and the Cambodian people themselves as an obstacle retarding many aspects of development - including poverty reduction (World Bank 2006). Due to the significance of this negative influence, promoting good governance, through anti-corruption procedures and other measures, has been presented as the first national strategic development plan (World Bank 2006, 2007).

3.1.3 Other social aspects

While Cambodians struggled for survival in these years, education seems to have held a lower priority for them, as shown in the primary school enrolment rate for 1993 which was 48% for males, and 46% for females. The primary school enrolment rate means "an estimate of the ratio of children of all ages enrolled in primary school against the country's population of primary school-age children" (World Bank 1997, P. 225). However, in the post-conflict years, access to education in Cambodia improved. The net enrolment rate in primary schools increased from 53% in 1997 to 76% in 2004 (Badloe et al. 2007). This net-enrolment ratio in primary schools means "the number of children enrolled in primary school who are of official primary school age, expressed as a percentage of the total number of children of official primary school age" (UNCEF 2007 p.121). The adult illiteracy rate was 20% for males and 47% for females in 1995 (World Bank 1997).

Educational expenditure is expenditure on a basic social service; therefore, it has been

regarded as one of the important indicators showing the current economic status of households, and the factor which influences the future economic opportunity of the household, through the child who receives the education (World Bank 2007). Educational expenditure in the Cambodian Socio-Economic Survey (CSES) 2004 demonstrated “extremely striking wealth-based differences” in per-child household education expenditure. Expenditure amongst the richest quintile was found to be 25 times greater than in the poorest quintile (World Bank 2007, p.127). Inferred from this (possibly theoretically) was that "perpetuation of wealth” has been "very pronounced" (World Bank 2007. p.124), as having higher education and higher income earning opportunities have been linked (World Bank 2007).

The education level of household members often correlates to the socio-economic status of the household (Bollen 2001; McPake et al.1996). In Cambodia, access to education above primary school level shows a level of income disparity: while the net enrolment rates in secondary schools for the period 2000 to 2004 were 17% for males and 11% for females (UNCEF 2007), the enrolment rate among households of the richest economic quintile in 2001 was 10 times higher than that among the lowest quintile (Badloe et al. 2007. p.3 Figure 1).

Embedded gender discrimination and socially defined gender roles made the situation of women worse than that of men in many aspects of Cambodian life; for example education (United Nations Convention on the Elimination of All Forms of Discrimination against Women: CEDAW 2004), as shown above. Cambodia was ranked lower in the United Nation’s Gender-related Development Index (GDI) (105th out of 144 countries) and in the Gender Empowerment Measure (GEM) (the lowest in Asia). The GDI represents the situation of women as it relates to levels of health, knowledge and income relative to men. The GEM represents the situation of women as it relates to decision making powers in national level politics and economic activities, and their opportunities of having "power over" economic resources (UNDP 2007: 360; Cambodia Royal Government 2004).

The Cambodian gender perspectives divide jobs between “appropriate” or “not appropriate” for women, and prevent them from getting highly-paid occupations (UNIFEM 2004). Therefore, an assumption is that in the health sector, normative gender roles seem to confine Cambodian women to traditional women’s occupations such as that of nurse and midwife, instead of medical doctor.

Even during the recent rapid economic growth, defined gender roles disadvantaged women relative to men in terms of increasing their income (UNIFEM, World Bank, ADB, UNDP, and DFID 2004; World Bank 2007). A small proportion of women benefited in terms of their employment almost solely in the garment industry, where, exceptionally, females comprise 90% of the work force (USAID 2006).

3.2 Development of the health sector

The underdevelopment of the health sector, including a general shortage of HRH has been a serious problem to the health of Cambodians. Although various development measures were taken; it seemed that more effective measures were being sought. The underdevelopment was immediately attributable to the genocide carried out by the Khmer Rouge regime and the following stagnant sector development. The genocide and forced labour inflicted by the Khmer Rouge is quoted as having reduced the number of doctors from 1000 to less than 50 (MOH 2002). However, this shortage has been re-balanced to some extent by their accelerated production since, particularly during the communist era. In 2000, the number of HRH per 1,000 people was 0.61 for nurses, 0.23 for midwives, and 0.16 for doctors (World Health Organization 2006). The shortage, i.e., excess demand, tended to undermine the morale of health professionals, which was claimed to have had a long-term negative impact on health services (Akashi et al. 2004). Health service delivery was largely restricted to the capital and a few relatively large towns (Hills and Tan Eang. 2007).

During the years of the communist regime in the 1980s, the health sector received limited support from the Western bloc countries; only NGOs and UNICEF had projects/programmes there (MOH 2002). Even after the Paris Peace Accord in 1991, because the political power of the former communist regime was influential in governing and developing the state, some ‘western’ bilateral donors refrained from supporting the new government. Instead, they supported NGOs, consequently, the NGOs responded to a large demand for health services including those from refugees and returnees. Due to this, the NGOs later participated in the official process of the health sector-wide management (SWIM).

Meantime, since the enhancement of coordination among donors including NGOs was regarded as important for the development of the health sector, in 1992 the World Health Organization (WHO) began to support the government in establishing and enhancing the national coordination mechanism. This was followed by the establishment of the provincial-level mechanism and processes towards a sector-wide approach which aimed at

effective and efficient resource use for prioritized issue areas. The SWIM was started for the inclusive purpose of coordinating prioritised areas and the support of NGOs through "formulating policy and managing all agencies and organisations, both public and private, with a common strategy and mutually agreed management arrangement" (MOH 2002, p. 62).

After the establishment of the new government, the flow of aid to the health sector from UN organisations, bilateral aid agencies and NGOs significantly increased; Public health expenditure depended on such international cooperation for as much as 88.6% of its funding (Lanjouw, S. et al. 1999).

During the same years, dual practice was claimed to have increased largely due to the shortage of health service delivery by government services (Akashi et al.2004). The dual practice has been quoted as being widespread and is attributed as having contributed to high out-of-pocket expenditures (van Damme et al. 2004), low quality of the government health services because of health workers' absenteesm and limiting service (Soeters and Griffiths 2003; MOH 2002; Hardeman et al. 2004; Jacobs and Price 2004; Akashi et al.2004; Chhea et al. 2010), as well as harmful medical practices (Vong et al. 2005; SRC 2006; Vong et al. 2005; Personal observation). Dual practice seems to be an open secret since it has been ubiquitous and privately admitted to by health workers. It was sometimes even conducted during official working hours (Soeters and Griffiths 2003; Chhea et al. 2010), despite the fact that government regulation prohibits this during working hours. Enforcement of the rule has been weak, although punishments included dismissals or transfer of the offender from the current health facility where they are working to a different one (SRC 2006). A study conducted by MOH (MOH 2005), which is described below and elaborated in Chapter 6, asked health workers about the number of hours worked and the number of patients health workers saw in their dual practice sessions in one week. The majority of the health workers who participated belonged to cadres with the highest qualification and who were working in the capital or in relatively big towns (MOH 2005).

Very little information about private health services as a whole in rural areas is available. This seems to be attributable to the low level of institutional development in the health sector. Even in the late 1990s, the rule of the central government had not reached into all local areas; remnants of Khmer Rouge actually ruled some areas. A coup d'état in 1997 made the capital into a battle field. During this time, the MOH was striving primarily to improve the government health service, and create the coordination mechanism for a large number of

cooperation agencies and NGOs. Only in the early 2000s, did the MOH begin to regulate the private health service sector.

3.3 The current situation of the health sector

The current situation of the health sector development still shows problematic features, particularly in relation to service delivery. With such problems, special measures like financial incentives to health workers may be easily conceived and argued for as necessary, but with little reference to assessing the likely impact on the health workers' and their households' income. This was despite there have been indications that they have a variety of income sources.

In the early 2000s, the health status of the Cambodian population was the lowest of all South Asian countries (MOH 2002). In 2001, the life expectancy at birth was 56 years and the infant mortality rate was 97/1000 live births (UNICEF 2003). A high poverty rate exacerbated this low health status (Khun and Manderson 2008; Huy et al. 2009; Hong and Mishra 2006).

Access to government health services was low due to the general shortage of health facilities, physical difficulties of access, and a shortage of HRH (MOH 2002). These problems were more acute in rural areas than in urban areas. A shortage of midwives was particularly critical (Sherratt et al. 2006). The HRH shortage has at times been eased by the employment of so-called casual staff who had medical qualifications but who had not obtained civil servant positions. Even unqualified personnel, who were neither government officials nor qualified medical staff, were hired at the discretion of the managers of the health facilities which were experiencing shortages (Abe 2008). This practice has exposed patients to potentially harmful medical procedures.

Government spending on the health sector has been low; and insufficient to improve the health status of the population. In contrast, out-of-pocket health expenditure was more than 10 times higher than government expenditure, i.e., $25.90 versus $2.50, in the Cambodian Demographic and Health Survey 2000 (ADB 2002a). This high out-of-pocket expenditure has been partly due to fees for private practice or to unofficial payments often requested at government health facilities (Soeters and Griffiths 2003). The high out-of-pocket expenditure causes catastrophic situations for poor households. In order to meet these high out-of-pocket expenditures, poor households often need to sell their property, thus becoming landless, or they need to borrow from money-lenders at a high interest rate, sacrificing other

economic activities to meet interest payments (Van Damme et al. 2004).

Under chronic budget shortage, the MOH has continued to be heavily dependent on funds from donors (MOH 2002), though concreate figures has been unrevealed. In addition, budget disbursements from the MOH to Provincial Health Departments (PHDs) and from PHDs to Operational Districts, has frequently been delayed, as is typically seen in "fragile states" (DFID 2005; World Bank 2010). Delayed disbursements have been problems for service delivery in Cambodia despite the fact that direct disbursement of budgets from the national treasury to prioritized national programs in Operational Districts has been set up.

3.3.1 Health policy

After the massive inflow of support, the MOH began to developed national health policies and plans (Grundy et al. 2009).

(1) Operational Districts: structure and services

The first prepared plan was designed to increase service delivery, strengthening district level basic health services for specific target groups: people in rural areas; mothers and children; vulnerable people such as orphans and the disabled, and strengthening the health care system through efficient resource management (MOH No date). The Health Service Coverage Plan, created in 1996, constructed a network of health districts named Operational Districts. An Operational District consists of an Operational District Office, a Referral (District) Hospital, and several Health Centres (around 10 to 20), and covers 100,000 to 200,000 of the population. This network aimed to:

1) expand health service coverage,
2) achieve appropriate use of resources,
3) establish a referral system and
4) increase efficiency of the management of Operational Districts.

The MOH redefined the functions of Referral Hospitals and Health Centres by introducing packages of health services to be provided by them. They are the Minimum Package of Activities (MPA) for Health Centres, and the Comprehensive Package of Activities (CPA) for Referral Hospitals (Table 3.1) which has three levels (CPA 1 to 3, from the lowest to the highest) designated according to the level of surgical facilities (MOH No date). There were 44 CPA2 and CPA3 hospitals (Annear, P. L. et al. 2008). For this plan, bilateral and multilateral cooperation agencies have provided supports for a variety of objectives (MOH 2002).

However, implementation of the policy had been disrupted by the inadequate capacity of the MOH (MOH 2002) as well as by problems caused by conditions inside and outside the health sector. For example, the number of health staff at rural health facilities has been much lower than the required number by policies (MOH 2002), frequently only half the number defined as required by the MPA policy (Personal observation). In an Operational District, most health workers who had higher medical qualifications were required to assume managerial roles at health facilities and offices; doctors or assistant doctors were required to act as the district managers or deputies. The construction of Health Centres in rural areas has frequently been delayed; consequently, as late as 2008, some Health Centres were operating without buildings, providing services at the home of a Health Centre staff member (personal observation).

Table 3.1 Outline of Minimum Package of Activities (MPA) and Comprehensive Package of Activities (CPA)

Minimum Package of Activities (MPA)		Comprehensive Package of Activities (CPA)	
Primary curative consultation (malaria, sexually transmitted diseases, diarrhoea)	Consultation for infants aged 0 to 4 (vaccination, management of malnutrition, prevention of vitamin A deficiency)	Referred cases	Medical and surgical emergencies:(amputation, strangulated hernia, appendicitis, transfusion, cardiovascular resuscitation)
Chronic Disease (TB, leprosy)	Care for pregnant women (antenatal and postnatal care, tetanus toxoid vaccination, prevention of anaemia, delivery and referral of complicated cases)	Complicated deliveries (extra-uterine pregnancy, obstructed labour, haemorrhage, retained placenta, Caesarean sections)	Simple surgery cases (hernia, cataract)
Birth spacing	Referral	Complicated TB cases	Hospitalization
Outreach Activities	Health promotion relating to all these activities	Laboratory diagnosis	Radiological and ultrasound diagnosis
		Rehabilitation	24 hour ward duty by skilled staff
			Health promotion relating to all these activities

Source: Ministry of Health, Guideline for Developing Operational District [no publication date].

(2) Human Resources for Health

In spite of these policies, plans and other guidelines (MOH 2006a, b, 2007a), staff

development and deployment have been facing problems. Ordinary rural Health Centres had no doctors, assistant doctors, (MOH No date) or secondary midwives. The accelerated production of HRH to some extent filled this gap, but the repeatedly changing duration or content of the training of HRH have caused problems in the quality of health services (MOH 2006b).

At the time of the fieldwork of this study (2007), MOH had a grading system of technical cadres and non-technical staff of MOH for managing basic payments and promotions (Table 3.2)

Table 3.2: MOH personnel grading system

Grade	Educational background*	Technical cadres and other categories
Grade A	4 year education after high school education	Doctors, dentists, pharmacists, non-medical staff with graduate education]
Grade B	2 year education after high school education	Assistant level staff of Doctors, Dentists, Pharmacists and Physiotherapists. Secondary Laboratory Technician. Secondary Midwives and Secondary Nurses who are in managerial positions at health facilities
Grade C	High school education	Primary and Secondary Midwives, Primary and Secondary Midwives, Primary Laboratory Technicians
Grade D	The required education level was not specified.	Drivers, Other manual labourers

Educational background* does not mean the education (training) to become HRH.
Source: MOH 2005

In the early 2000s, responding to chronic shortage of HRH (doctors, assistant doctors and secondary midwives) in rural areas, and issues related to low salaries for HRH, the MOH and cooperation agencies adopted merit-based performance payments (MOH 2006a). Two types of regimes were introduced, with higher payments than ordinary government salaries, for a group of staff in high managerial positions in the MOH or the PHD (MOH 2006a). However, the regimes were short-lived not because of outcomes of the payments but of results from criticism of the extra payment by other ministries and issues involving the relationship between the government and cooperation agencies (Personal observation).

(3) User-fees

User-fees were introduced in 1997 in order to serve several purposes. They were intended to decrease:

1) unofficial payments such as under-the-table-payments (Barber et al. 2004; Hardeman et al. 2004; Van Damme W et al. 2004), including formalisation of them (Ensor 2004) and

2) out-of-pocket expenditure (Barber et al. 2004; Hardeman et al. 2004; Van Damme et al. 2004)

as well as to increase:

3) the quality of health services,

4) the operational budgets of Health Centres and Referral Hospitals,

5) the income of health workers, hence increasing staff motivation (Jacobs and Price 2004; Soeters and Griffiths 2003).

The level of user-fees was set, through community participation in each Operational District, to reflect the socio-economic situation of the community.

Government rules defined the allocation of user-fees collected at the health facility level: 1% should be sent to the national treasury and another 1% to PHD, 50% for the operational budget, and 48% for supplementing the salaries of health workers employed by the health facility. However, no rules had been set for the allocation of funds within the 48% designated to supplement salaries (Noirhomme et al. 2007). In 2006, the allocation to operational cost was increased to 69% (MOH 2007b).

(4) Equity Fund

Poor people in the community were exempted from the user-fees; an 'equity fund' supplemented the loss of user-fee incomes from those exempted. The ‘equity fund’ was set up primarily in hospitals in Operational Districts through funds made available by cooperation agencies or NGOs. Twenty-six equity funds existed in government hospitals in 2006 (Noirthomme et al. 2007) and almost half of the Operational Districts accessed this fund (Annear et al. 2008). Studies of a limited number of these equity funds showed positive results in increasing the access of the poor to health services (Hardeman et al. 2004; Van Damme et al. 2004; Noirthomme et al. 2007; Jacobs et al. 2006; Annear et al. 2008; Ir et al. 2010).

Community-based health insurance was also begun by NGOs, in order to reduce the burden of health expenditure among the less-poor population (Jacobs and Price 2006; Annear et al. 2008; Ir et al. 2010). Community-based health insurance has expanded slowly and, in 2003, the government included it in its health policy framework (Annear et al. 2008).

(5) Decentralization

The decentralization of national government and administrative reform have been promoted since the mid-1990s, and have advanced the MOH's delegation of planning, financing and other administration to PHDs and Operational District Offices. However, this delegation has been slow: hindered by the insufficient capacity of PHDs and Operational District Offices to undertake the delegated responsibilities (Men et al. 2005).

(6) First national strategic plan

In 2002, the MOH developed the first national strategic plan for the heath sector for the period 2003 to 2007. This strategy had 6 thematic areas: Non-communicable-disease, Health service delivery, Behavioural change, Quality improvement, Human resource development, Health financing, and Institutional development. Creation of this strategic plan was expected to strengthen the MOH's leading role in sector wide management (MOH 2002).

(7) Private sector health services

Private clinics were rare, even in Phnom Penh, until the mid-1990s, but almost never seen in rural area. Since the mid-1990s, provisions of private services have increased, probably as a result of dual practice by government health workers (Rose et al. 2002; CENET and University Research Co. Ltd. 2004; Options/DFID 2001).

The government has been regulating the private sector health services for only a decade, mainly in Phnom Penh. After 2009, regulations increased significantly (Fujita 2012). In 2011, 4,962 private clinics (including polyclinics) were licensed (Fujita 2012). Regulations state that the owner of a clinic cannot be an MOH staff member; and dual practice is prohibited. However, there are no dual practice regulations relating to the health staff of clinics (Fujita 2012).

While there are no studies available about private health services during those years, a few studies were carried out by consultants, NGOs and MOH on the services available to the urban poor. These indicated that there were problems in the quality and prices of the services and found that most service providers were government health workers (Rose et al. 2002; CENET and University Research Co. Ltd. 2004). The prices were unacceptably high, compared with the annual household expenditures of patients (Options/DFID 2001).

3.3.2 Payments to government health workers

In Cambodia, as illustrated below, payments to government health workers usually consist of a variety of payment types including government salaries, supplementary salaries and per-diems from cooperation agencies and NGOs, as well as income from private practice. The existence of a variety of payments suggests that incentive measures to health workers

need to take these payments into account.

(1) Government regular payments

Government salaries for health workers have been extremely low when compared with living cost (Akashi et al. 2004; Soeters and Griffiths 2003), quoted as $10 to $30 per month in the early 2000s, encouraging dual practice (Soeters and Griffiths 2003). The major component of the government salary is based on cadre (Table 3.2); other components are: seniority, length of service, and a family allowance (paid only to males). While the salaries are due monthly, payment is often delayed. Low salaries have caused the prevalence of dual practice (Japan International Cooperation Agency: JICA 2002; Soeters and Griffith 2003). In 2005, the Prime Minister of Cambodia, bypassing the legislative process, increased salaries to government officials including health workers by 15%. Since then, the salaries of health workers have been raised by around 10% every year; however, due to the low original salary level, the increases have not made a substantial difference (Fujita 2009).

Government salaries have discouraged people from pursuing careers in the government health sector, since the salaries are regarded as imbalanced when compared with the educational investment required (Personal observation). This argument seems to be particularly apt for midwives (Sherratt et al. 2006). Government salary levels have caused a 'brain drain' of staff from the MOH to NGOs and an absorption of graduates from government health training institutes into NGOs' health facilities. Low salaries also contribute to persistent shortages of some types of HRH in rural area (Personal Observation).

Unofficial payments to the health workers prevailed (Soeters and Griffiths 2003; Van Damme et al. 2004; Barber et al. 2004; Hardeman et al. 2004; Akashi et al. 2004), partly due to the nature of the public sector (Dixit 2002; Besley and Ghatak 2003) and also due to the under-developed institutional settings of the government health sector. However, after the adoption of the user-fee system, requests for unofficial payments appeared to reduce (Akashi et al. 2004). The amount individual health workers receive has been largely unstudied. Fairly frequently, limited numbers of health workers received honoraria for conducting training or for teaching (Personal observation).

As outlined above, two regimes of meritocratic performance-based payments were applied to the specific group of staff.

(2) Income from private practice

Information about government health workers' income from dual practice has been largely unavailable, except for the MOH study which investigated their income from and work hours

for private practice (MOH 2005) and was referred to above (more detailes in Chapter 6). However, it has been obvious that the incomes have been higher than their government salaries, indicating that dual practice has negatively affected government service delivery (Soeters and Griffiths 2003; Akashi et al. 2004). This implies that the effect of financial incentives in the government sector is highly likely to have been influenced by private practice income.

(3) Supplementary salaries and per-diems

Supplementary salaries and per-diem payments from mainly NGOs or national programmes were important sources of income for health workers. Although these payments varied, depending on the role of the health worker, the workload and the organisation which made the payment, generally their contribution to annual income was significant, relative to government salaries. The amounts were in the tens of US dollars per month (Personal observation). These amounts were still significant, when compared with the quoted government regular salaries above. There were no government rules relating to health workers' receiving these payments (KI14, April 23, 2005), and health workers were often eager to receive them.

Supplementary salaries from the Global Fund have been claimed to reach to hundreds of US dollars if the recipient health worker was at a senior level in MOH (Personal observation). Per-diems paid by NGOs, UN Organisations and the national program ranged from US$2.00 to US$31.5. Most organisations surveyed provided more than US$20.00 for an overnight stay in Phnom Penh for those travelling from a province (MEDICAM 2006). This money was often saved by the recipient by various means.

In Cambodia, supplementary salaries and per-diems were understood to be influenced indirectly by the patronage system (Tan 2008), and their allocation affected the management of service delivery (Personal observation). The patronage system seemed to distort the allocation of opportunities among health worker for receiving salaries and per-diems and to reduce meritocratic aspects of payments. The chief of the Operational District would gain respect, and could exercise leadership smoothly, if they were able to secure outside projects and programmes, because of the resulting payment of supplementary salaries and per-diems to health workers in their Operational District (KI11, August 14 2006).

If high supplementary salaries are paid, in parallel with performance-based payments, in a contracting setting, they may compete with the performance-based payments for efforts, i.e., influence on allocation of heatlh workers'labour supply from the multiple-task setting was enhanced by the project attached to these payments. Per-diems received for attendance were

a strong pull for the health workers, often regarded as a cause of the frequent absence of health workers from health facilities due to their attendance at training courses (Smith 2003). Thus, these payments often proved detrimental to the carrying out their government work (Personal observation). Therefore, supplementary salaries and per-diem payments were likely to influence the effect of government financial incentive.

(4) Share from User-fee income

The objectives and allocation methods of the user-fees were explained above, together with the lack of information on the amount of money health workers received.

(5) Other incomes

Unofficial payments to the health workers were prevalent (Soeters and Griffiths 2003; Van Damme et al. 2004; Barber et al. 2004; Hardeman et al. 2004) but decreased after the adoption of the user-fee system (Akashi et al. 2004). However, little is known about the payment individual health workers received. Honoraria for conducting training or teaching were received fairly frequently by a small number of health workers (Personal observation).

3.3.3 NGO activities in the health sector

The activities and presence of NGOs in the health sector have been significant, as described above. Their involvement, particularly in health service delivery, has increased - around 100 NGOs implemented projects between late 2006 and early 2007 (MOH 2007a). The NGO umbrella organisation, MEDICAM was established in 1989 (Vaux et al. 2005). It participated in the SWIM with UN organisations and bilateral donors as described above.

NGO perspectives on health sector development in Cambodia have varied. Some NGOs have collaborated with the MOH, in such cases as the equity fund or the contracting out of government health services (Annear 2008; Ir et al. 2010; Soeters and Grifitths 2003; Jacobs et al. 2010), showing the strong influence and presence of NGOs. However, other NGOs have not followed national policies or have even taken contrary approaches to national policies.

As described above, NGOs absorb government health workers and graduates from health training institutes. However, the NGO jobs were often said to be more demanding of staff than the government work required (KI02 May 27 2007; KI15, 27 March 2007, KI17 July 18 2007). Job security at NGOs was also uncertain, since relatively big NGOs could suddenly dismiss a large proportion of their local staff, in response to changes in the focus of their funding-source (often bilateral cooperation agencies), e.g. from health education in HIV/AIDS prevention to access to ARI (Personal observation).

3.4 Cambodian contracting of health services

3.4.1 ADB pilot project

(1) Features

The ADB Pilot Project has been seen as a successful example of contracting out as well as performance-based payment; however, what factors made the payments effective have not been thoroughly studied. In particular, the implications of payments to health workers' and their household income need to be studied in more depth. This pilot project started in 1998 with a hypothesis that "the government might deliver health service more effectively and efficiently through administering contracts to non-governmental entities" (ADB 2004, P. vii). The Pilot Project ended in 2003. In the Pilot Project, five Operational Districts were contracted to four NGOs: HealthNet International, the Association of Medical Doctors of Asia, Save the Children France, and Save the Children Australia. One of the contractors voluntarily applied performance-based payments to the government health workers who were working in the district contracted out.

Two types of contracting were implemented in this pilot project: 'Contract-out' and 'Contract-In'. They differed in payments and other human resource management of HRH, drug and supply procurement and budget disbursement procedures (Table 3.3). 'Contract-Out' was implemented in two Operational Districts and 'Contract-In' in three Operational Districts. 'Contract-Out' was delegated a larger authority over human resources to NGOs than 'Contract-In'.

Table 3.3: Differences between 'Contract-Out' and 'Contract-In' Operational Districts

	Management of HRH	Procurement and budget disbursement
'Contract-Out'	- allowed the NGO contractors to employ health workers who had been working in the Operational District. The health workers employed took leave of absence from the MOH and made individual employment contracts with the NGO contractor. The contractors could form their own staff-mix and dismiss the health workers. - allowed the NGO contractor to decide payments to health workers.	- allowed the NGO contractors to purchase drugs and supplies as they liked, following the procurement guidelines of ADB. - allowed the NGO contractors to receive an operational budget directly provided by the project, not through the MOH.
'Contract-In'	- did not allow the NGO contractors authority to employ and dismiss health workers (the NGO contractors requested proper deployment of health personnel in terms of both the number and the cadre, from MOH. However, their requests were not fulfilled). - required the NGO contractors to maintain the previous staff-mix and to work with health workers previously employed. . - The health workers were still paid government monthly salaries.	- required the NGO contractors to obtain drugs and supplies through the normal MOH route. But this caused delays, and thus problems for health service delivery and other activities of 'Contract-In'. - The operation budget disbursements were made through the normal MOH framework with ordinary operation budget for an Operational District, and delays of disbursement occurred.

Source: ADB 2004; Soeters and Griffiths 2003.

(2) Payments to health workers

This section presents information on the main forms of payment to the health workers in the pilot project, but includes less on the amount of the payments, due to a limited availability of

information. Presenting the amounts lies beyond the scope of this study.

In 'Contract-out' Operational Districts, health workers were employed by the NGO contractor and were paid NGO-based salaries. As a result, the payments were much higher than payments in 'Contract-In', even though in 'Contract-In" Operational Districts extra payments were paid to the health workers by the NGO contractors (KI14 April 23 2005; KI13 Aug 26 2006). Among the extra payments a particularly notable one was performance-based payment, which is described below.

(3) User-fee income

A higher proportion of user-fee income than the national rule was allocated to health facilities in the ADB Pilot Project; after 1% was remitted to the Provincial Health Office and another 1% to the national treasury from the total, the remaining 98% could be used for payments to health workers (MOH 2007b).

(4) Prohibition of dual practice

The level of restriction on private practice varied among the NGO contractors; one of them totally prohibited it but others only applied partial restrictions (KI01, June 19; KI02, July9, 2007; KI03, July 10, 2007).

(5) Performance-based payments in the Pilot Project

An NGO contractor (HealthNet International: HNI), which implemented 'Contract-in' within the Pereang Operational District, Prey Veng Province, introduced performance-based payments through the setting up of sub-contractual relations in 2001, two years after beginning of the project (Soeters and Griffiths 2003). It is argued that these payments contributed to the increase in health service coverage as well as to the efficiency of health service deliveries (Soeters and Griffiths 2003). These outcomes matched the objectives of project.

The payments were connected to the volume of output. Dual practice among health workers was totally prohibited, with punitive measures in place for enforcement. "The total income of health workers from government health work (comprising performance-based payments, supplementary payments from HNI, shares from user-fee income and government regular payments) was quoted as totalling 500 to 800% more than their basic government salary (Soeters and Griffths 2003). However, the percentage of each component is unclear, thus the economic importance of performance-based payments is also unclear.

(6) Evaluation of the pilot project by ADB

An evaluation of the ADB Pilot Project made by ADB, a funding source to the project,

investigated the experience of eight Operational Districts: two 'Contract-Out'; three 'Contract-in'; and three control Operational Districts. The ADB evaluation argued that contracting was effective and successful in various respects: increasing output of health services, 'cost effectiveness', raising the quality of services as well as improving equity (ADB 2001, 2002a, b, 2004; Keller and Schwartz 2001). Other studies supported some of these views (Soeters and Griffiths 2003; Annear et al. 2006). However, elaborations of performance-based payments, supplementary salaries, and user-fee allocation and payment arrangements or mechanisms seem to be lacking in the ADB evaluation and in other studies and reports which supported the positive evaluation.

Service coverage

On average, output indicators of health service delivery increased by more than 3 times in 'Contract-out' and by 1.8 times in 'Contract-in' Operational Districts during the project duration (calculated from ADB 2002a. p.36). However, they decreased in the controls (Appendix 1). The quality of services was also better in 'Contract-out' and 'Contract-in' Operational Districts than the control Operational Districts (Appendix 1) (ADB 2002b).

Cost effectiveness

The cost effectiveness of service delivery was found to be better in 'Contract-out' and 'Contract-in' Operational Districts than in the controls. However, the definition of cost effectiveness used in the evaluation was ADB's own definition. It was defined as "the average percentage of change(s)" in all eleven indicators, such as the number of cases of antenatal care, "divided by the average total cost per capita over the 2.5-year pilot period" (ADB 2002b P.36), and thus it differed from the cost effectiveness analysis (CEA) in health economics.

Equity

The evaluation argued that the pilot project gave benefits to people belonging to lower socio-economic groups through decreasing their out-of-pocket health care expenditures (ADB 2002b). However, the project results could be seen as too mixed to be able to support such a definitive conclusion. In fact, out-of-pocket expenditure increased in two 'Contract-in' Operational Districts, while it decreased in two 'Contract-out' and in one 'Contract-in' Operational District (ADB 2002b).

3.5 DFID/World Bank Contracting Project

Because of the positive evaluations of the pilot project (ADB 2001, 2002a, b, 2004; Keller and Schwartz 2001; Soeters and Griffiths 2003) and MOH's acknowledging this, a new contracting out project (hereafter referred to as the 'DFID/World Bank Contracting Project' because they were the main funders) was begun. In this project, performance-based

payments were required to be applied because of the experience of a district in the pilot project. The results of this new project were also praised by the supporting donors and the MOH (MOH 2007b).

(1) Features

The DFID/World Bank Contracting Project was one of the components of a larger Health Sector Support Project (HSSP), supported by World Bank, DFID and other cooperation agencies. It was implemented from May 2004 to December 2008 and covered 11 Operational Districts, including 5 of the Operational Districts where the pilot project had originally been implemented (MOH 2007b). Table 3.4 shows the 11 Operational Districts with their provinces and the NGO contractors.

Table 3.4: Operational Districts contracted out in DFID/World Bank Contracting Project

Operational District	Province	NGO contractor	Note
Peareang	Prey Veng	Healthnet International	The province having a border with Vietnam
Preah Sdach	Prey Veng	Healthnet International	The same as above
Kirivong	Takeo	Swiss Red Cross	The same as above
Angroker	Takeo	Swiss Red Cross	The same as above
Memot	Kampong Cham	Save the Children Australia	The same as above
Ponhakrek	Kampong Cham	Save the Children Australia	The same as above
Sre Amble	Koh Kong	Care	The province being along the Gulf of Thailand
Smach Meanchey	Koh Kong	Care	The same as above
Banlung	Ratanakiri	Healthnet International	The province having borders with Laos and Vietnam; plateau area
Senmonorum	Mondulikiri	Healthnet International	The province having a border with Vietnam, below Ratanakiri, the western part of Cambodia
Tbeng meanchey	Preag Vihear	Health Unlimited	The province having a border with Thailand and being border conflict area. Plateau area.

Note: Note in the table was added by this study.

Source: World Bank 2008.

These 11 Operational Districts were selected, because of their perceived difficulty in increasing health service delivery. This was due to a combination of factors, including: their remote, rural and impoverished location; having ethnic minorities; or being affected by border conflicts with another country (MOH 2001, 2007b; World Bank 2006, 2007). The NGO Contractors were five relatively well-known international NGOs. A Cambodian NGO, the Reproductive Health Association of Cambodia (RHAC), was a sub-contractor of an international NGO for the implementation of the project in Preah Sdach Operational Districts (Table 3.4).

This project did not have the two types: 'Contract-in' and 'Contract-out', having only one type. There was less left to the NGO contractors' discretion in this project, compared with 'Contract-out'. They were required to procure drugs and supplies and to implement budgets within the framework of the MOH system, though they received specific project budgets. The budget for the project implementation for each Operational District was based on a per-capita budget by district. However, the framework caused problems in implementation because of chronic shortages and delays in physical and financial resources (MOH 2007b).

The MOH established a monitoring team for the implementation of the project. This MOH monitoring team visited these Districts quarterly. The monitoring included qualitative aspects, such as patient satisfaction with health services. Guided by the results of the monitoring process, the MOH disbursed the budget funds to the Operational District on a quarterly basis; however, disbursements were sometimes delayed. In addition, each NGO contractors created their own monitoring mechanism to access their subcontractors' performance (KI12, August 8 2006).

(2) Payment arrangements and sub-contracting

Payment arrangements for health workers were considerably changed from the pilot project; the NGO contractors decided the details but without the NGO's obligation to report on the payments. Consequently, at the time of writing this thesis, limited information about payments was available, with the amount available varying among the NGO contractors. Features relating to the payment arrangement are outlined below (further details are described in Chapter 5):

1) Government regular payments continued as before;
2) Performance-based payments were incorporated into sub-contractual relations between the NGO contractor and the Operational District Office or the individual health facilities (Health

Centres and Referral Hospitals);
3) Existing government health staff, working for the Operational Districts, were seconded to the DFID/World Bank Contracting Project NGO contractors;
4) Abstention from private practice by the health workers was required (no levels or quantified indicators were specified);
5) Parts of user-fee income was required to be sent by sub-contractors to the Operational District Office (MOH 2001).

The user-fee income of health facilities was also allocated to the health workers after a proportion was sent to different organisations: 1% of the user-fee income went to the national treasury; 1% to the PHD; a certain percentage (which varied in each of the Operational Districts contracted out) went to the Operational District Office. The remaining user-fee income was allocated to the individual health workers (MOH 2001).

(3) MOH Review of DFID/World Bank Contracting Project

The MOH conducted a review of the DFID/World Bank Contracting Project (MOH Review) in order to extract recommendations for the MOH's own plans to implement a wider application of internal contracting (MOH 2007b). In the course of the pilot and this project, the MOH conceived of the idea that the advantage of the contracting out, i.e., increasing health service delivery, could be achieved in their preferred form, 'internal' contract. The internal contract was to set the PHD as the principal, with the Operational District Offices and health facilities acting as the PHDs agents. The internal contracting was partly consistent with the Cambodian government's goal of decentralisation.

The timing of the review was more than one year prior to the end of the project. It included an evaluation of the achievements of each contracted-out district and of the project as a whole. The review presented a limited amount of detailed data; however, from the review, those factors exclusively relevant to our study are outlined here.

The performance-based payments were given a high evaluation, as they were judged to have brought in positive changes: improvements in the coverage and quality of health services, increases in health workers' incomes by appropriate amounts; improvements in their motivation, increases in attendance during working hours; and improvements in attitude. However, it is unclear what economic criteria were used to judge the level of payments as appropriate. Health workers' incomes from different sources were mostly excluded from the judgement about the effect of payments.

The review recommended prohibitions of dual practice (MOH 2007b). This recommendation seemed significant when its implications of changing the incentive environment were considered. However, the recommendation included few details of the proposal; it contained few descriptions of levels of reduction of dual practice, punishment, mechanism and institutional arrangement concerning prohibition and punishment.

This review did not compare the achievement with those of the control Operational Districts. The main results of the review, in the areas in common with the ADB Evaluation (ADB 2002a), are shown in Table 3.5.

Table 3.5: Result of MOH Contracting Review on service coverage, quality of care and equity

Service coverage	Quality of care	Equity	Per capita expenditure
4 of 6 indicators for the year 2006 were achieved. Achieved indicators: antenatal care, deliveries at government health facilities, full immunizations, provision of vitamin A. Unachieved indicators: delivery assisted by trained attendants, birth spacing	Improved aspects: health service delivery, accountability of health services to patients, attendance of government health workers.	Data to show changes in equity was not specified in the review.	US$3.83 to US$14.98 (average: US$7.30)

Note: Details of the indicators: both the targeted and achieved were not described in the reports. Target indicators for each contracted Operational District differed and stipulated in the contract agreement.
Source: MOH 2007b p.29, 53.

The review assessed the quality of care provided, though the contract agreement between each of the NGO contractors and the MOH does not have specific indicators relating to the quality (MOH 2007b). Details of descriptions and figures supporting the review assessment lacked elaboration.

The review maintained that data relating to access to health services by the poor was lacking in the project documentation, but it still expressed concerns about decreases in access to health services due to user fees and the inadequacy of the equity fund (MOH 2007b).

The review views the level of the annual per capita health expenditure of the project (Table 3.6) positively, compared with the national average of US$4.11 in 2005, which was regarded as too low (MOH 2007b) to provide adequate health service.

1) Performance-based payments

The review maintained that the health workers had been receiving "proper" incentives and "higher" income, that their attendance at health facilities had been adequate, and that health workers were present "most of the time" due to "proper" incentives. However, elaboration of the interpretation of "proper", "higher", or amounts of income and "most of the time" (MOH 2007b P.50) appeared to be insufficient for the conclusions advanced. Consequently, the important things left unexplored by the review were the impact of payments in terms of the economic implications, the changes in their working hours which could be inferred by the economic impact (or may be directly investigated), and the incentive environment affecting the payments.

2) Dual Practice

The review contained limited descriptions of dual practice and its reduction, but mentioned that dual practice might have caused staff absences "during weekends" (MOH 2007b P.60). This highlighting of weekends seems to be almost irrelevant, time-wise, when compared to the frequency of absenteeism in weekday afternoons caused by dual practice (Personal Observation). No concrete descriptions of income from, or changed labour supply due to, dual practice were elaborated. The recommendation to prohibit dual practice with punishments did not give any specific details of the level of prohibition or punishments proposed.

(4) Capacity assessment

Separate to the MOH Review described above, the MOH also conducted a capacity assessment of all 11 contracted out Operational Districts (Table 3.4), other non-contracted out Operational Districts and PHDs. It employed the absolute evaluation method, and it was conducted in 2008, shortly before the end of the project (MOH 2008). Only one of the two assessment reports expected to be published (MOH 2008) was available during the period of the writing of this study. The background purpose of this assessment is closer to that of the MOH Review; obtaining recommendations from it to guide the MOH's planned internal

contract relations (MOH 2008). It did not investigate details concerning performance-based payments. Consequently, this assessment was less relevant to the focus of the current study, the impact of performance-based payments to health workers. Some assessed areas were not stipulated as the objectives of the contracting out and even out of the authority of NGO contractors, e.g., allocations (deployment) of human resources.

The contracted out Operational Districts received a mediocre evaluation: the average score in the seven areas related to managerial competence was around half of the possible score in the evaluation on the absolute scale (MOH 2008). This contrasts with the positive evaluation of the project in previous reports and studies; however, the areas assessed here were different from the focus of previous studies. No comparisons were made between the situations before and after the implementation of the contracting project. Table 3.6 show the results of the assessment.

Table 3.6: Results of MOH Capacity Assessment of the Operational District contracted out

Areas assessed (7 areas)	Areas scored over 50%	**Areas scored below 50%**
- Planning - Monitoring and supervision - Human resources allocation and management - Technical support - Essential drug management - Financial management -Coordination	- Drug management (64%) - Human resources allocation and management (61%) - Financial management (59%)	- Planning (37%) - Monitoring and supervision (44%) - Technical support (49%)

3.6 Conclusion

The government health system of Cambodia has been facing issues that are typically seen in "fragile states" and other LMICs. The contracting out projects, including the pilot project, has been viewed as successful in increasing and improving health service delivery. Also, the performance-based payments paid in the projects have been regarded as a sufficient incentive for health works to raise their performances. However, evaluations of the impact of payments were limited. There was limited assessment of the payments' economic impact on the health workers' and their household income. The incentive environment and its influence on the impact of the payments were barely touched on in these studies.

Chapter 4 Methodology and Methods

4.1Introduction

This chapter presents the methodological framework of this study followed by the methods applied, which took the form of mixed methods research. Rationales for this study's using the mixed methods research are explicated. In the section on methods, details of qualitative and quantitative methods employed are described. After this, description of the study site and a discussion about the validity of quantitative investigation of this study follow. Finally, ethical consideration made for this study is described.

4.2 Methodological framework

4.2.1 Epistemology

Epistemology is a branch of philosophy which deals with how we understand, acquire, and explicate what we know (Crotty 1998). According to Crotty (1998), epistemology refers to "the theory of knowledge embedded in the theoretical perspective and thereby in the methodology" of a study. The epistemological approach of a researcher therefore guides the development of the research design and methodological choice (Carter and Little 2007). The epistemological position that this study largely embraces is post-positivism and, to a lesser extent, pragmatism. While positivism has often been regarded as a foundation of empirical methodology, post-positivism, argues Clark (1998), "has replaced positivism as that which underpins most researchers' empirical method" (p. 1243). Unlike positivism, with its focus on "discovering infallible and universal laws" (Clark, 1998, p. 1244), post-positivism acknowledges the influence on accepted reality of theoretical and cultural frameworks and conjectures (Phillips and Burbules 2000) and "that the outcome of investigation is an estimation of the truth rather than the truth itself" (Houghton et.al. 2012; p. 30). These views, and others described below, are appropriate to the subject under investigation of this study because the income and expenditures of government health workers studied were influenced by 'unobservable factors' such as culture and social trends. Second, performance-based payments investigated in this study are usually constructed deductively on the theory of contracting, and this study develops its arguments about the payments in the Cambodian case based on this theory. However, the design as well as the impact of the payments inevitably have been influenced by the social and cultural context in Cambodia.

(1) Post-positivism

In order to explain post-positivism, it is necessary to refer first to positivism and the challenges to its main premises. Positivism argues first, that an ultimate understanding of the

world is possible through knowledge; second, that theories must be grounded in empirical observation which can be tested, thus inferred theories are rejected; third, observation of the empirical world provides the only foundation of knowledge, thus theories of "non-observable things" are rejected as speculation in the metaphysical sphere (Phillips and Burbules 2000: p.9, 11). Finally, the argument of 'logical positivism' centres on "the theory/observation distinction" which maintains that "observation was independent of theories that they could serve as evidential warrants to appraise the adequacy of theories" (Phillips and Burbules 2000, p.9, 11). Many researchers considered that if empirical methods were not founded on the positivist view, the justification of the findings may not be convincing (Clark 1998). Yet, as Clark (1998) argues "positivism employs an overly reductionist view of the person in its quest for universal mechanistic rules which are culturally independent" (p. 1245).

Positivism has been challenged repeatedly by different proponents of the science of philosophy. One of the main groups of challengers were Karl Popper and his followers, who argued the fallibility of knowledge and that theories are falsified or corrected or adjusted or discarded by other theories that have superior points. Thus, this group regards scientific theories as historically situated conjectures. However, they still maintain that science aims at finding the truth of existence and that theories are valued according to their degree of success in achieving the truth (Chalmers 1999).

Another significant critique of Positivism was made by Thomas Kuhn, who denied that the development of science is produced through the sequential accumulation of new knowledge one piece at a time. He maintains that it occurs through periodic paradigm shifts which transform scientific inquiries in the area; that all paradigms include anomalies, and that these anomalies, not falsifications, disturb the development of science (Chalmers 1999). At the extreme end of the challenges, the view of Feyerabend situates science in the same rank as the mythologies or theories employed by enigmatic sects or religious groups (Chalmers 1999).

However, many of those who questioned positivism, but continued to find some of its features useful, forged post-positivism and argued that:
a. observations are inevitably theory-laden, thus rejecting the argument of separation of theories from observations (Phillips and Burbules 2000);

b. knowledge is inevitably grounded on conjecture (speculation or inference) which has assertions capable of being adjusted or even discarded (Phillips and Burbules 2000);
c. accepted reality is framed by theories and cultures (Phillips and Burbules 2000) and is "imperfectly apprehendable" (Houghton et.al. 2012, p. 35);
d. the fallibility of induction is inevitable (Phillips and Burbules 2000);
e. the researcher (the observer) is not thoroughly isolated from the inquiry (the observed) (Clark 1998);
f. The aim of science and the value of theories consist of the degree to which they are helpful in approaching"'warranted assertability' as opposed to the 'truth'" (Houghton et al. 2012, p. 35).

As Clark (1998) argues, studies founded on post-positivism do not reject qualitative data or findings obtained through qualitative methods, individual experiences or the meaning of the experiences. The successful combination of quantitative and qualitative methodologies is also noted by Houghton et.al (2012) in their examination of health researchers who chose post-positivism for its emphasis on "the importance of multiple measures and observation" (p. 35).

(2) Pragmatism

The philosophy of pragmatism entails (though this is not an exhaustive list): rejection of traditional dualism; recognition of two parallel worlds, "the natural and physical world" and "the social and psychological world" which included human institution, subjective thoughts, language and culture. It has specific views of knowledge, truth, and theories. It views knowledge as a composition by constructed knowledge and knowledge articulating "the reality of world". It views knowledge, the current truth and meaning as tentative and changeable. It regards theories as instrumental according to their "predictability and applicability" (Johnson and Onwuebguzie 2004, P. 18).

Pragmatism emphasises that evaluations of a theory or concept need to examine how that theory or concept functions, and its consequences (Houghton et al. 2012). It is noted that both post-positivism and pragmatism originate in the 'realist' tradition which views reality as framed by experience, and as complex and multidimensional (Houghton et al. 2012).

Pragmatism enables researchers to emphasise an area of interest by taking any epistemological and methodological approach which are appropriate to the context but without struggling with rhetorical construction (Houghton et al. 2012). Because of these

features, pragmatism is often employed in mixed-methods research (Houghton et al. 2012). (Mixed-method research is explained in the next section.) Pragmatism requires the research methods and data to articulate the research question, and to provide important results for the participants (Houghton et al. 2012). These requirements are considered to be fulfilled by mixing methods and approaches, and generating tentative results which lead to final synthesized results (Johnson et.al 2007).

4.2.2 Mixed methods research

Mixed methods research is defined by Johnson and Onwuegbuzie (2004, p. 17) as "the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study." Creswell and Plano Clark (2009, p. 5) maintain that mixed methods research "should incorporate many diverse viewpoints" and that "the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone." As noted above, pragmatism has generally been associated with mixed methods, since it offers an 'umbrella' paradigm allowing the convergence or combination of quantitative and qualititative methods. Pragmatism, as already noted, places less emphasis on epistemological purity, and more on 'what works' with an emphasis on the research questions that call for "real-life contextual understandings, multi-level perspectives and cultural influences" (Creswell et al. 2011, p. 4). Similarly, post-positivists are also open to both quantitative and qualitative data and even advocate the "importance of multiple measures and observation" (Houghton et al. 2012, p. 35), particularly in policy research. This is of particular relevance to a mixed methods research design as outlined below.

Mixed methods began to be increasingly applied at the end of 1990s; Creswell and colleagues (2004), for example, noted that in 1999 a National Institutes of Health (NIH) task force issued guidelines that called for the application of mixed methods in health research. In other words, the NIH were calling for qualitative research to become more routinely used in health sciences to "improve the quality and scientific power of data" through its combination with the "clinical trials, surveys of attitudes and beliefs, and the epidemiological measures" used in quantitative research "to better understand health problems" (Creswell et al. 2011, p. 2). Ozawa and Pongpirul (2013) concur with this view and suggest that mixed methods is also important when undertaking health systems research "because it allows researchers to view problems from multiple perspectives, contextualize information, develop a more complete understanding of a problem, triangulate results, quantify hard-to-measure

constructs, provide illustrations of context for trends, examine processes/experiences along with outcomes and capture a macro picture of a system" (Ozawa and Pongpirul 2013, p. 2).

Mixed methods research has the advantage of accommodating more than one methodological approach with the aim that research is practical and effective in answering the research questions (Johnson and Onwuebguzie 2004). This was particularly apt for the current research study since it required a combination of quantitative and qualitative research methods to fully investigate the effect of performance-based payments on health worker behaviour in a complex incentive environment.

Bryman (2006 in Bryman 2012) analysed the reasons given by researchers for choosing mixed methods research, noting that the 'enhancement' or augmentation of findings from either qualitative or quantitative data was the most frequently stated reason. Table 4.1 lists the ways that these studies combined qualitative and quantitative research according to Bryman's study (2012, pp. 633-34).

Table 4.1 Ways of combining quantitative and qualitative research (Bryman 2012:pp. 633-34)

Rationale	Purpose
1.Triangulation or greater validity	Refers to the traditional view that quantitative and qualitative research might be combined to triangulate findings in order that they may be mutually corroborated.
2.Offset	Refers to the suggestion that the research methods associated with both quantitative and qualitative research have their own strengths and weaknesses so that combining them allows the researcher to offset their weaknesses to draw on the strengths of both
3.Completeness	Refers to the notion that the researcher can bring together a more comprehensive account of the area of enquiry in which he or she in interested if both quantitative and qualitative research are employed
4.Process	Quantitative research provides an account of structures in social life but qualitative research provides a sense of process
5.Different research questions	This is the argument that quantitative and qualitative research can each answer different research questions…
6.Explanation	One of the two research methods is used to help explain findings generated by the other
7.Unexpected results	Refers to the suggestion that quantitative and qualitative research can be fruitfully combined when on generates surprising results that can be understood by employing the other
8.Instrument development	Refers to contexts in which qualitative research is employed to develop questionnaire and scale items, for example, so that better wording or more comprehensive closed answers can be generated
9.Sampling	Refers to situations in which one approach is used to facilitate the sampling of respondents or cases
10.Credibility	Refers to suggestions that employing both approaches enhances the integrity of findings
11.Context	Refers to cases in which the combination is rationalized in terms of qualitative research providing contextual understanding coupled with either generalizable, externally valid findings or broad relationships among variables uncovered through a survey
12.Illustration	Refers to the use of qualitative data to illustrate quantitative findings, often referred to as putting 'meat on the bones' of 'dry' quantitative findings
13.Utility or improving the usefulness of findings	Refers to a suggestion, which is more likely to be prominent among articles with an applied focus, that combining the two approaches will be more useful to practitioners and others
14.Confirm and discover	This entails using qualitative data to generate hypotheses and using quantitative research to test them within a single project
15.Diversity of views	This includes two slightly different rationales – namely, combining researchers' and participants' perspectives through quantitative and qualitative research respectively

	and uncovering relationships between variables through quantitative research while also revealing meanings among research participants through qualitative research.
16.Enhancement or building upon quantitative/qualitative findings	This entails a reference to making more of or augmenting either quantitative or qualitative findings by gathering data using a qualitative or quantitative research approach

Timing and sequencing of either one of qualitative and quantitative methods is important and relates to the priority given to one or the other method (Creswell et.al 2011). Bryman (2006) presented nine types of approaches for the timing and sequencing, incorporating the weight of each qualitative and a quantitative method. Bryman's typology is straightforward: he first divides types of mixed methods into three categories by weight: priority on quantitative methods, on qualitative methods, and equal priority. Under each of these three categories, three types of the sequence were set. However, finding the best connection between the priority and the sequences seems to be critical and requires careful consideration.

Using Bryman's typology, my study design belongs to the type which places an emphasis on quantitative methods with the sequence starting from a qualitative method followed by quantitative methods.

Creswell et.al (2011b) also identified four major sequencing designs which seem to be comprehensive. The designs consist of: convergent, in which the two designs are conducted in parallel; sequential, in which one builds on the results of the preceding method; embedded, in which the two methods are conducted again in parallel but with the one data collection method 'nested' in the priority method to add insights; and multiphase which involve multiple projects sharing common overall objectives are "conducted over time with links in place so that one phase builds on another" (Creswell et.al 2011b, p. 8). My study design is the sequential in which the quantitative research was build on the result of the preceding qualitative method.

As seen above, there are advantages in employing mixed methods research and approaches. However, it is critically important to synthesise and appropriately integrate the results from the quantitative and qualitative methods. Some mixed method research presents the results from the two methods separately, with insufficient synthesis and integration. Reflecting this integration in writing up the results is important and requires it to be "more than the sum up of its parts" (Bryman 2006. p.699).

4.3 Methods of this study

4.3.1 Mixed methods research

In order to investigate the two research questions, both quantitative and qualitative methods were applied. Applying mixed methods was expected to increase the research capacity of this study since the characteristics of the subject issues and the research environment suited this approach, described below. Also, the rationale accorded with what Bryman maintains for mixed methods as noted in Bryman's list presented in Table 4.1. Of the 16 reasons listed, eight were relevant for the application of mixed methods to this study: triangulation, completeness, process, explanation, credibility, context, utility, and enhancement, as follows.

1 Triangulation and enhance validity

Given the shortage of literature and previous study, results from both methods provide another venue for triangulation and enhance validity.

2 Completeness

The mixed method approach was expected to provide a more comprehensive understanding of the impact of payments associated with the contracting settings. The qualitative methods were likely to result in an understanding of context, process, mechanism of the payments and other relevant aspects to the payment while the quantitative methods addressed the relative effects of variables concerning the payments.

3 Process

The qualitative methods of this study were expected to deepen understanding about the implications of institutional processes and rules.

4 Explanation

Results from the qualitative methods were expected to extend the explanation of results from the quantitative methods which the non-experimental settings were likely to constrain.

5 Credibility

Enhanced credibility of the findings was expected to result from integration of findings by employing mixed methods. This was important in the given study environment where findings might contain discursive features due to the shortage of literature and information particularly in Cambodia.

6 Contextual understanding

The mixed method approach was highly likely to contribute to contextual understanding, since the mixed methods employed within this study performed a similar function to those described by Bryman, with "qualitative research providing contextual understanding coupled with" a "broad relationship among variables uncovered through a survey." (Bryman 2012 p.634).

7 Utility

The combination of the two methods was expected to increase the usefulness of findings from this study, since the quantitative methods were likely to suggest the appropriate level of payments associated with the contracting settings and the qualitative suggesting the appropriate operation of the mechanism and institutional settings.

8 Enhancement

The result from the quantitative methods about the allocation system operating at health facility level was expected to enhance the findings relating to the entire institutional arrangement of the payments, which were expected to be derived from the qualitative methods.

Before deciding the methodology and methods, empirically researching subject issues involving incomes (Deaton 1997) and matters concerning money considered to be difficult and demanding. Difficulty in obtaining such information was intensified by the information asymmetry (Milgrom and Roberts 1992). More importantly, the subject issues appeared to be complicated and multifaceted. As illustrated in Chapter 2, the theory of change concerning the subject involves different spheres such as individual, organisational, operational as well as institutional spheres. The research environment had generated little literature and publicised information on the subject, exacerbated by situations in Cambodia as a post-conflict fragile LMIC where the physical, social and institutional infrastructure was not conducive to the conduct of a robust study.

In this study, qualitative methods complemented quantitative methods, with quantitative being the dominant method. In keeping with Creswell et.al (2011a), a sequential design was instituted, in which qualitative data collection was followed by two quantitative surveys. In this design, the qualitative method preceded quantitative methods, contributing to the

following quantitative method. This design is also effective to this study because it accommodates a straight forward implementation by a single researcher and emerging needs from the qualitative phase with a quantitative phase (Creswell 2011a). The sequence of each research method in the process of this study is shown in Figure 4.1 below.

The outline of the three investigations and their relations including contributions to each other and the entire research processes are as follows.

1) Qualitative (key informant interviews) :

Investigation of the mechanisms of the payments associated with the contracting settings and the incentive environment. The investigation had the following detailed objectives and contributed to the following tasks and processes.

- Obtaining information about the incentive environment and the payment mechanisms associated with the contracting settings,
- Obtaining information for important variables to be collected and formulating questions for the household survey and primarily enhancing construction of the household survey,
- Obtaining information that serves theoretical selection of variables in regression analyses,
- Obtaining information that serves selection of the control group districts,
- Helping the interpretation of results of quantitative investigation.

2) Quantitative (household income and expenditure survey and regression analyses)

Investigation of health workers' and their households' incomes and expenditures and of the impact of payments associated with the contracting settings. These investigations were expected to be contributed to by the qualitative investigation as described above.

This study used a quasi-experimental cross-sectional survey design to respond to the research questions. The design consisted of the household income and expenditures survey followed by descriptive statistical analyses of the result and regression analyses for the impact of payments using the data for income (Ensor et al. 2009, Durmont et al. 2008) and expenditure (National Bureau of Statistics, Tanzania and Oxford Policy Management Ltd, UK. 2001) from the household survey. Variables for these investigations included those identified in the results of the key informant interview.

3) Quantitative

A mini-survey investigated allocation methods of payments associated with contracting, such as performance-based payments, at the Health Centre level (the subcontractor level). This investigation was expected to provide information about the payment mechanism and the

incentive environment and to help in the interpretation of the results of the quantitative investigation.

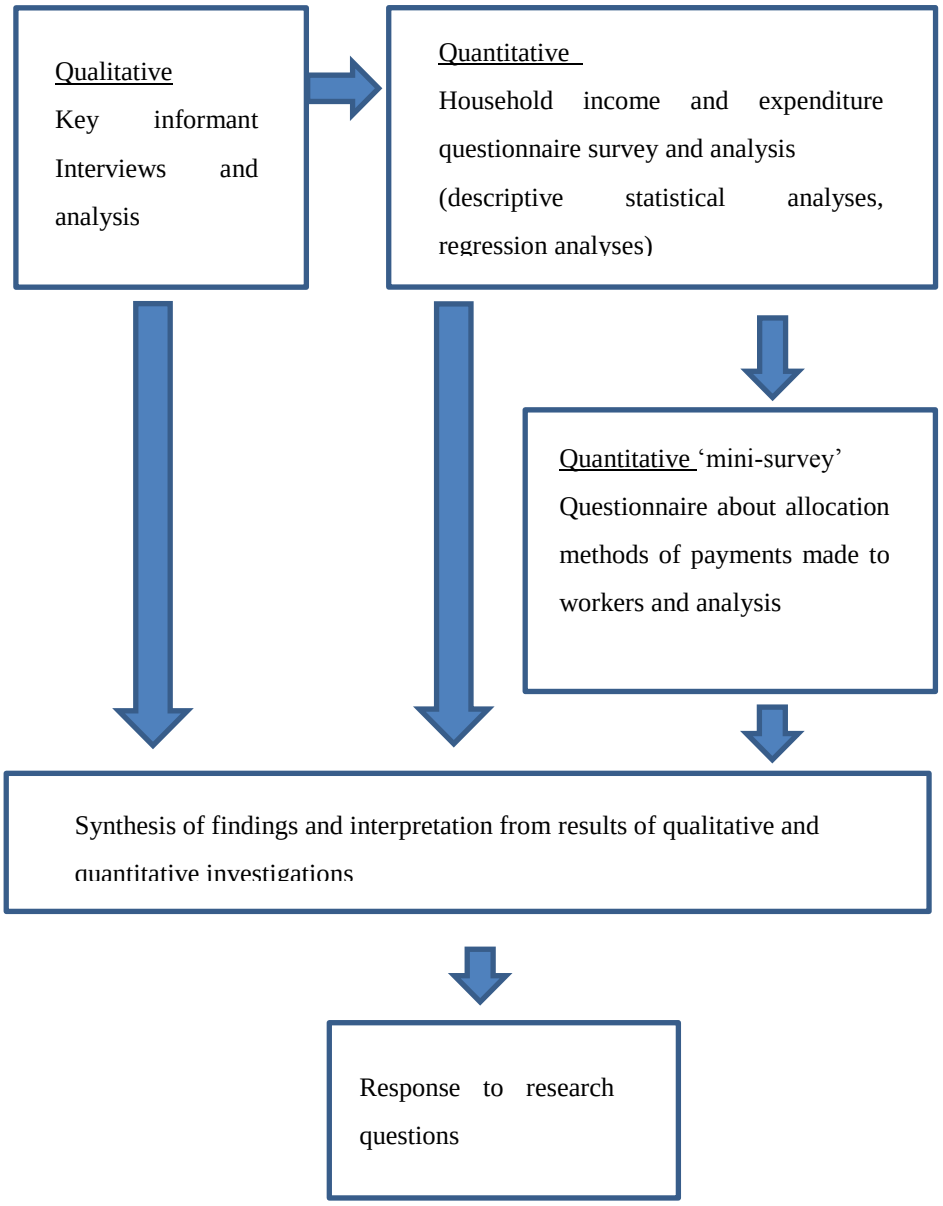

Figure 4.1: Sequence of research methods

Questionnaire surveys have been widely applied in studies of economics, including health economics, to ascertain incomes and expenditures of different units of study: individuals, households, organisations and countries, and some of these questionnaires are regarded as an established method (McCoy et al. 2008; Ferrinho et al. 1998; Macq et al. 2001; Ensor et al. 2008; Deaton 1997; Grosh and Glewwe 1998; World Bank 2010; Luxemburg Income Study 2010).

The second research question asks, "what is the importance of performance-based payments to the income of health workers and their household income?" This question explores the impact of performance-based payments and other incomes to the income of health workers and their overall household incomes.

Quantitative studies which investigated the impact of a specific income to other incomes and to the total income of an individual (or the individual's household) have been accumulated. Quantitative methods identify the features of the impact with proper treatment of the issue of variations and multiplied variations (Deaton 1997; Grosh and Glewwe 1998).

However, in health economics, it is noted that so-called latent variables inevitably influence the data empirically collected (Jones 2000). This study partly drew on the qualitative method (the interviews) to explore the latent variable.

Alongside these epistemological and theoretical issues, it is noted that applying quantitative methods in this study required hiring a person with sufficient skills, knowledge and qualifications in language and qualitative methods, in order to supplement the investigator's limited command of the Khmer language.

4.3.2 Qualitative methods

There were two reasons for conducting qualitative research at the beginning of the study. First, to better understand the incentive environment, interviews were conducted with key informants most of whom had management responsibilities. Such interviews were designed to gain insights into the incentive environment pertaining to the contracting setting through the experience and descriptions by the interviewees (Kvale 1983; Silverman 2004). Second, as outlined earlier, the qualitative study contributed to the formulation of questions for the two questionnaire surveys and the analyses and interpretation of results of empirical studies.

(1) Key informant interview

The overall purpose of the key informant interviews was to gain a better understanding of the mechanisms of the payments associated with the contracting settings, contributing to the tasks and processes in the study as outlined above.

The key informant interviews were considered necessary given the shortage of data including publicized data. The method accommodates flexibility for both the interviewer and the key informants; interviews with the same informants were possible over a longer period; questions were in the form of open-ended or structured, and could be changed or restructured as desired; the snowballing techniques allows an increase in the number of key informants (Tremblay 2005 in Burgess ed. 2005). Key informants "are able to provide more information and a deeper insight into what is going on around them" (Marshall 1996, p. 92).

Selection criteria for key informants are concerned with five characteristics: "role in community", "knowledge", "willingness", "communicability" and "impartiality" (Tremblay 2005 in Burgess ed. 2005). The "role in community" concerns their "formal roles" which expose them to the information the research seeks and it is the primary criteria to be fulfilled by the informant. The informants should have knowledge in the form "intelligible to the interviewer" (Marshall 1996, p. 92).

Referring to these criteria and the objectives of the interviews, 18 key informants were purposively selected based on the purpose of the interviews and attributes of the informants which enabled them to provide sufficient information that this survey wished to obtain.

Core interviewees were managers of the NGO Contractors who knew and operate the payment mechanism in the incentive environment at the field level. Other interviewees were expected to add information about the mechanism and environment and increase the accuracy of information. Those who were not officially involved in the contracting project were expected also to provide information which may contrast with information provided by those inside the project. The purposes, attributes of respondents, and timing of interviews are described below.

1. Managers of the NGO Contractors responsible for implementation the contracting project of DFID/World Bank Contracting Project

Purpose: To obtain information about the incentive environment and the mechanisms of the payments associated with the contracting settings. The information included the payment mechanism institutional arrangements concerning dual practice and factors which influenced the incentive environment. Questions about management and operations of the implementation of contracting project were also asked.

They were expected to provide detailed information because of their positions as managers of the contractors who were responsible for implementation. They were working for prominent international and national NGOs and had experience in managing health projects. The information and perception were expected to be derived from their understanding of the incentive environment.

1) KI01: Fred Griffiths, Manager of Healthnet International (HIN) Peareang Project, Manager
April 23, 2005, March 17, 2006, June 19, August 22, September 5, 7, 2007.
2) KI02: Or Sivarin, RHAC Preah Sdach Manager
Feb 27, March 10, 2 May July 24, 2006, May 2, 27, July 9, August 22, 2007.
3) KI03: Bart Jacobs, SRC Takeo Province, Kirivong Project, Manager
July 30 2006, May 19, July 10 Aug 27 2007.
4) KI04: Rob Overtoom, SRC Takeo Province, Manager.
April 22 2005, March 17, 2006, May 19 June 4 2007

Interviews with the above included e-mail correspondence between 2005 to 2007, and some in 2008.

2. Staff of NGO Contractors who were working at the project sites
Purpose: To obtain additional information on the payment mechanism and management and operations of the implementation of contracting project.

They were expected to provide detailed information based on their operations and observations which occurred during their daily interactions with the health workers.

5) KI05:Anonymous, staff, HIN Peareang Project, March 17, June 19, 2007.
6), 7), 8) KI06, 07, 08 : Anonymous, staff, SRC Kirivong Project, July 30 2006, May 19 2007.

3. Government health workers of Operational Districts contracted out
Purpose: To obtain information on the mechanism and operation and practices concerning the payments in the specific Operational Districts.

The information from these informants was expected to provide greater details, particularly those at the health facilities. Also, these informants might have seen the incentives, the payment mechanism and the incentive environment differently from the NGO managers. Therefore, informants were expected to add importantly different perspectives regarding the payment mechanism at the facility level.

9) KI09: Anonymous, Health Worker, Peareang District, September 1 2007.
10) KI10: Anonymous, Health Worker at the managerial level, Kirivong District, July 12 2007.

4. Government health workers in managerial positions working outside of CODs and MODs
Purpose: To obtain additional information and perceptions relating to the incomes of general government health workers outside of the contracting project.

Because of their positions, these informants were expected to elaborate different types of incomes such as private practice income and household income from non-health related economic activities.

11) KI11: Anonymous, Health Worker at the managerial level. August 14, 2006.

5. MOH staff based in Phnom Penh responsible for the implementation of the project
5.1 Purpose: To obtain information concerning the entire contracting project and about the operations of CODs, which could then be compared with the information provided by the NGO Contractors.

Becase of their responsibility, information with a high degree of accuracy and details was expected to be provided by them.

12), 13) KI12, 13, Anonymous, two staff in charge of ADB Pilot Project and DFID/World Bank Project, August 8, 2006.

5.2 Purpose: To obtain information on the payments associated with the contracting settings, information on the general situation of dual practice of health workers and other aspects of the incentive environment.

14) KI14: Anonymous, one staff member that was in charge of various projects supported by bilateral and multilateral development organisations, April 23, 2005, May 16 2006

6. NGO managers (involved in other development projects)
6.1 NGO manager in rural development
Purpose: To obtain the information which enhance construction of the household survey. The information includes that about livelihoods and life in rural Cambodia relating to household expenditure and income in the health workers' households which enhance the socio-economic and geographical information of the study site. Obtaining the information about income generations and behaviours relating to monetary transactions among ordinary and wealthy Cambodians and health workers.

15) KI15: Suon Seng, Project Manager of field work of this study, R & D Manager, Director, the Cambodian Centre for Study and Development in Agriculture: CEDAC.
March 15 , 23, 27, 2007, May , 2 to 26 , 2007, June 1 to 6, several times in July 2007, June 14, 2011

6. 2 NGO managers in the health sector (in other health sector projects)
Purpose: To obtain information concerning different types and sources of income and their significance to government health workers. To obtain information about dual practice among government health workers. The information was expected to enhance the construction of the household survey. Interviewees were Cambodian staff with more than a decade of experience of NGOs which were the outside of the contracting project. They were knowledgeable about the sector and the contracting project. Their Cambodian perspectives were valuable to deepening understanding the context of the contracting project.

16), 17), 18) KI16, KI17, KI18 Anonymous, three managers, Cambodian office, international NGO in the health sector, March 28 2007, April 25, 2006, July 21 2007, April 22, May 24 2007

The interviews were semi-structured using interview guides in some cases (Appendix 2) but in other cases they were asked questions informally with an open structure, particularly when the investigator visited the project site. The interviews were conducted by the investigator in English at (the project sites and Phnom Penh) during 2005 and 2007. Interviews were transcribed by the investigator; none of the informants accepted tape-recording of their interviews. The content was induced and compared with content provided by different informants. After this, some of the induced content was used for selecting questionnaire variables or formulating hypothesis. During this process, the snowball method accommodated interviews with persons from within MOH and NGOs who provided different or deepened explanations and views. Triangulation was made by referring to literature.

4.3.3 Quantitative methods

As noted above, the quantitative methodology was dominant in the mixed methods approach taken in this study. Two separate surveys were undertaken, with the household income/expenditure survey the dominant of the two. However, during the household survey, it became apparent that different methods pertained for allocating payments from the payments associated with the contracting setting by different sub-contractors (Health Centres). A 'mini-survey' was designed to further investigate these differences and to include outcome from the investigation in the final analysis about the impact of performance-based payments.

The income/expenditure household survey took a quasi-experimental cross-sectional design and the mini-survey a cross-sectional design. The majority of the description that follows, however, is devoted to the household income/expenditure survey.

Quasi-experiments are "studies that have certain characteristics of experimental designs" (Bryman 2006, p. 56). Quasi-experimental design has advantages in terms of conducting evaluation research studies of interventions in a society or organisation concerning the effects of interventions. The design adequately responds to a common condition of such interventions in that it is impossible to randomly assigning the participants to either the treatment or the control group. However, a doubt about the internal validity arises since quasi-experimental studies lack random assignment and since the treatment and control groups "may not have been equivalent" (Bryman 200, p. 56). Thus, the design "does not fulfill all the internal validity requirements" (Bryman 2006, p. 56), a concern noted by several researchers (Mash and Mash, 2012; Toulany et.al 2013; Harris et.al. 2004; Craig et.al

2008). Craig et al. (2008) suggest that a quasi-experimental design suits a situation "where the intervention is irreversible, necessarily applies to the whole population, or because large scale implementation is already under way" (p. 981); the latter situation was found in the setting of this study. Also of relevance to this study, Harris et.al (2004, p. 1587) identify "an inability to randomize locations" as a reason for considering a quasi-experimental design.

Despite the challenges presented to internal validity, which is not considered optimal (Craig et.al 2008), such studies are considered to "yield useful results" while noting their limitations and "wherever possible, evidence should be combined from different sources that do not share the same weaknesses" (Craig et.al.2008, p. 337). Bryman (2006) agrees, suggesting that causal inference may be increased by additional information which helps to prioritise or discount interpretations and causal links brought about by the absence of experimental design; he further argues that the results are strongly supported because they are not artificial and hold high ecological validity. Ecological validity concerns "social scientific findings were applicable to peoples' everyday and social settings" (Bryman 2006, p. 48). The validity is less sufficient in those researches which are valid in the technical aspect of methods, procedures and operations, but have little relevance to what is actually happening in people's everyday lives (Bryman 2006). The subject of this study is a policy intervention, i.e., the impact of payments associated with the contracting settings in the rural Cambodia. With the subject of this study, employing a quasi-experimental study design was suitable and expected to strengthen the validity of findings. This is because the ecological validity of the findings should have high applicability and relevance to the sphere with which the impact is concerned. The impact was exposed to various incidents of daily life, which influence the sphere relating to the incentive environment, some of which may be unseen. The health workers were also exposed to these happenings (Bryman 2006). The control group in this study was expected to highlight and help to clarify the impact of payments. It is noted that in this study, designing a study which compares ex-ante and ex-post of the DFID/World Bank project was impossible because the project began before this study.

(1) Household income and expenditure surveys: household as a unit

Empirical investigation of this study was designed to ascertain the incomes of government health workers, sources of income, plus their household incomes generated through other activities and expenditures. This study applied the concept of household as the unit of consumption consisted of household members which miximises the utility under the budget constrain while providinding labour or capital in the market (Samuelson 1956 quoted in Lundberg and Pollak 1993, Pass, C. L., Collins Dictionary of Economics 2005)(Chapter 2,

2.6.2). The expression is as follows.

$$\sum_{i=t}^{n} pix\, i \leq m,$$

where i is kinds of goods (i=1…n), pi is price of i, $x\ i$ is consumption of i, and m represents income.

The study drew extensively on a household expenditure survey in order to ascertain the incomes of government health workers and their household. This was because household expenditure is a function of household income and the household expenditure survey is more able to capture an accurate picture of the household economy (Deaton 1997). To the household survey, the concept of permanent income, not of transitory income, was applied due to its general applicability to household income and expenditure surveys (Deaton 1997) and its inclusion of attributes of the income earner (Freidman in Bollen et al. 2001; Bollen et al. 2001).

Economic theory maintains that since all income of a household is consumed during a specific time period, the total income equals the total consumption within the household. Over more than one time period, savings could be made by a household; however, over a longer time, if seen in present value terms, the average level of consumption and that of income are equal (Deaton 1997). The advantages of measuring expenditure (consumption) over measuring income have been argued for less in relation to economic theories but more in relation to practical factors: measuring expenditure raises fewer problems than measuring income (Deaton 1997). Household expenditure surveys elicit more accurate features of household economic status than a household income survey in the one-year reference term, since the frequency of receiving income varies among individuals as well as households, e.g., farming households may receive income less frequently than seasonally (Deaton and Grosh 1998 in Groch and Glewwe 1998). However, apart from this practical knowledge, economic theory maintains the smoothing of household income and expenditure in a specific time period (Deaton 1997).

The working definition of a household employed by this study is as follows: a household is defined as the state of dwelling together, by covering living costs including food costs from funds pooled together by different sources or household members (Deaton 1997).

A household questionnaire survey is a widely used method to ascertain income and expenditure (Deaton 1997). In addition, expenditures themselves are relatively well accepted as an indicator of economic status in development studies (Ravallion 1996). The percentage of questions about expenditure is much larger than that of questions about income. The design of the questionnaire of this study included the coping measures for highly inevitable issues in the survey and reflected the Cambodian context.

Household questionnaire surveys of incomes or expenditures have been frequently conducted by national governments and the accumulated knowledge of the economic situation of households have been used for policy formulation and implementation by governments. In the field of development, World Bank had conducted 110 household surveys in LMICs by 1998 (World Bank 1999 cited in Devereux et al. 2004). Other scholars have also applied these methods, including in the health sector (Fabricant 1992; McPake 1996). Most of the previous surveys mainly employed quantitative methods, in the framework of microeconomics (Deaton 1997; Deaton and Grosh 1998; Ravallion 1996; Groch and Muñoz 1996).

This study largely drew on the established (conventional) theories, methods and lessons learned from the experience of World Bank's Living Standard Measurement Surveys (LSMS) (Chapter 2) which was thought to increase the robustness of this study and provide reasonable data for my research questions.

The LSMS asks a "great" many detailed questions on (Deaton 1997, p. 27) consumption in order to arrive at figures of expenditure by grouping questions into sections and aggregating the answers (Deaton and Grosh 1998). The questions include those about income, assets, use of social service, possessions of durable goods, and access to basic infrastructure (Deaton 1977).

The LSMS ask for: different categories relating to the price of goods (the purchasing price, the resale price); market information pertaining to prices such as the real interest rates; the consumer price index or current market prices, depending on the approach of each survey (The World Bank Poverty and Human Resources Division 2001).

Relatively common sections of the questions of different LSMS, though still comprehensive, are shown in Table 4.2.

Table 4.2: Examples of the sections in the LSMS questionnaire surveys

1. Attributes of members of the household
2. Education 3. Health 4. Migration
5. Employment 6. Housing (materials and utility)
7. Agricultural (forestry and fishery) and livestock
8. Food-expenditure and home production
9. Non-food daily (fuel, electric light bulbs etc.) and annual expenditure (clothes, shoes, etc.)
10 Durable goods 11. Income and remittance (receiving)
12. Borrowing, lending, and savings on the day of the survey

Source: Nepal Central Bureau of Statistics. no date; Grosh and Muňoz 1996; Deaton 1997; The World Bank; Poverty and Human Resources Division 2001.

LSMS, enhances the accuracy of responses by including respondents who have detailed and accurate knowledge of consumption of specific types of goods and services (Caslely and Lury 1987; Deaton 1997; The World Bank; Poverty and Human Resources Division 2001). The data was collected by the survey visit and/or sometimes by the household having kept written records of consumption (Deaton 1997). The main characteristics of LSMS are shown in Table 4.3.

Table 4.3 Main characteristics of LSMS survey

Number of questions	**Recall period**	**Reference time**	**Respondent**
The number differs among the LSMS surveys.	Reasonable frequency of paying the expenditure, e.g., a week, a month, and a year.	Conventional time-period subject for either household income and expenditure: one year.	Respondents include those who know the household consumption the best
Visiting respondent	**Aggregation of expenditures**		
Some surveys have two visits.	a. Multiplying monthly food expenditures by twelve; b. Adding expenditures on other items such non-food goods (e.g., clothes, fuels) and education, after annualisation if necessary		

Source: Caslely and Lury 1987; Deaton 1997; Deaton and Grosh 1998 cited in Grosh and Glewwe 1998; The World Bank; Poverty and Human Resources Division 2001.

(2) Household income survey

Components of this study's household income surveys drew on the national surveys produced by the Luxembourg Income Study (LIS). LIS is a data archive of cross-national income surveys, which began in 1983 and contains data collected at various time periods relating to more than 30 countries, both developed countries and LMICs (Luxemburg Income Study [online] 2010). It is reasonable to draw on selected surveys placed in LIS for determining the components since the survey data in LIS has been used and referred to in studies in health sector (Subramanian and Kawachi 2004; Lynch et al. 2001) and includes national surveys conducted by governments such as Canada and the United States which are presumed to have applied appropriate frameworks in order to collect accurate data. Items included in components vary by country (Statistic Canada. 2000, U. S. Census Bureau 2000 and Australian Bureau of Statistics 2001 in Luxemburg Income Study [online] 2010) and are not necessarily aggregated. Examplens of main components are shown in Table 4.4.

Table 4.4: Income components of surveys in the LIS

Aggregated income components	Not-aggregated income components
- Wages and salaries (both employed and self-employed) - Net-income or net-loss from self-employment - Government cash transfer (pension, allowance, benefit) - Private cash transfer (annuities, alimony, child support) - Interest (on savings and or bonds) and dividends	- Income in-kind - Inheritance -Capital gains and losses

Source: The LIS web archives. http://www.lisproject.org/techdoc.htm **(Luxemburg Income study [online] 2010).**

It is difficult to come to a firm conclusion regarding the accuracy of an income survey, since there are few studies that discuss their accuracy (including household income surveys). Kangas (2000) argued that LIS does hold accurate information on income, but the designs and means of implementation of the surveys he was referring to were not detailed in his paper, which could be a reasonable source for judging their accuracy. In contrast, having

praised the usefulness of LIS, Behrendt (2000) also indicated that under-reporting of income and the problem of low response rates exist in LIS.

There have been issues concerning the accuracy of household income surveys. In response, this study undertook coping measures; however, overall, this study intended to mitigate these issues by establishing the data about household expenditure through a household expenditure survey.

Sensitivity about income, which could be regarded as higher than sensitivity about consumption, leads to issues of reluctance or refusal on the part of respondents to provide information (Deaton 1997). Bollen et al. (2001) suggested that disaggregating income by enquiring about its source could help with eliciting the information of household's consumption. This study adopted this strategy based on the available knowledge of Cambodia health sector, rural life and livelihoods, the anthropology of Cambodia and information from the key informants (Chambers 1997; Mosse 1994).

Under-reporting income compared with expenditure may occur partly due to inflation rising over the recall period. The recall period of income is often the year before the survey, and that of expenditure the week or the month before. This often causes reported income to be low relative to consumption due to inflation (Paxon 1992). In Cambodia, after the data collection of this survey, high inflation began in September 2007 (Ginting and Bird 2009).

Obtaining accurate data on income from rural farming households often encounters difficulties in LMICs due to these households' frequent confusions about the production, sale of that product, benefits from the sales, and home-consumption (Casley et al. 1987; Deaton 1997). However, since the subjects of this study related primarily to the households of government health workers, not farming households, such confusion had been expected to be limited. Also, the scale of the contribution of farming activities to total household income was estimated to be limited.

In households in some countries, such as Thailand and Taiwan, accumulated assets (savings) disproportionate to their household income, such assets as seeds, cattle, money and gold inter-temporally (Deaton 1997); while surveys of both household income and expenditure rest on the theory that total income equals total consumption over a certain term. The relevance of such a high level of saving is regarded as being of less importance to this study,

because in rural Cambodia, there is often a tendency for surplus money to be spent quickly (Ebihara 1968).

Survey-based estimated household income may generate multiple levels of understatement and become lower than the real income (Deaton 1997). These disparities are expressed by using a sign of inequality as follows.

a) Survey-based income $<$ survey-based expenditure (4.1)

b) Survey-based expenditure $<$ the real income (4.2)

From a) and b),

c) Survey-based income $\ll$ the real income (Deaton 1997). (4.3)

The survey-based income is often lower than the survey-based household expenditure of the same or an equivalent group (4.1) (Deaton 1997). This could be attributed to any of the reasons mentioned above. Survey-based expenditure itself tends to be understated, compared with actual income (4.2), again for various reasons as mentioned above. Because of these two potential situations, it might be concluded that the gap between the real and the survey-based income is large (4.3) (Deaton 1997). However, if survey-based income is largely understated, total expenditure could be used as a proxy for income (Casley and Lury 1987). This study explored the possibility of under-reporting by comparing the total household expenditure with the total household income.

Reflecting these factors and in order to increase the accuracy of reported income, this study created accounting frameworks corresponding to flows of money or material (e.g. food bartered) of the economic activities (Deaton 1997). The knowledge of Cambodian rural livelihood and life were applied to the creation of the frameworks.

Another measure employed to increase accuracy was to apply experiences and approaches of nation-wide household surveys and the Cambodian context. The experiences and approach of the Cambodian Socio-Economic Survey (CSES), a series of national household surveys, were shared with the investigator by core staff of the National Institute of Statistics (NIS) of Cambodia. These surveys have been conducted since 1993 (but not annually) by the NIS. The CSES in 2004 aimed to determine the living standard and poverty level of the

Cambodian population, and collected data from 15,000 sample households. The survey covered 7 focus areas of information which had 16 sections in total (Appendix 3).

Another series of established national household surveys was the Demographic and Health Survey (DHS). The DHS in 2005 was administered by the National Institute of Public Health (NIPH) of Cambodia and the experiences and approach of conducting DHS was also shared with the investigator. The DHS is a well-known USAID programme which collects the demographic and health data in LMICs. It has been conducted in over 75 LMICs, with a total of 200 surveys completed (http://www.measuredhs.com/ accessed August 18, 2010).

Table 4.5 shows the main categories in the questionnaire and the factors or states which the questions referred to in each category. It is noted that they are not sections and do not appear in the same order as they do in the form of sections in the questionnaire survey.

Table 4.5 The main categories and factors of questionnaire

Basic Information	Expenditure	Income	Others
- Geographical and administrative information, - Household members, - Their attributes	- Education - Foods - Non-food goods - Utilities - Agricultural (forestry and fishery) and livestock - Health - Non-farm self-employment - Gifts and donations (money) given outside the household	- Health workers - Other employed household members - Household enterprises (the primary industry, manufacturing, or others) - Income and remittance received (transfers such as pensions, other welfare money, saving, remittance) - Borrowing, lending, and savings	- Possession of durable goods - Material goods of the house

For these main categories and factors, questions were cautiously formulated and sections and sub-sections were set up. The questionnaire sheets (English) are included at Appendix Part II The Khmer version is available upon request to the investigator.

(3) Health workers' and their household Income

1) Important variables to be collected and hypothesis about them

Based on this study's knowledge of the potential diversity of income sources of the government health workers was hypothesised. Therefore, questions about their income sources were divided into three main categories, reflecting the core interest of this study: income from health work excluding private practice (the income obtained in the government sector), income from dual practice and income from sources other than health work such as agriculture or the employment income of the health workers' other household members. They were assumed to be intricately connected to each other in the incentive environment where the performance-based payments were paid (but only in CODs). The majority of these incomes was regressed in the regression analyses as explained below.

There were subcategories in the three main categories. Subcategories of the income from health work excluding private practice were described including their definition in Chapter 3.

1) Incomes obtained from their employment as government health workers
Government regular payments
Performance based payments (paid only in the District contracted out)
Supplementary salaries from NGOs and/or donors
Per-diems
Honorarium for giving training or lectures
Share from user-fee income;
2) Private practice income
3) Incomes from sources other than health work
Employment work by household members of the health workers
Household enterprise
4) Total household income(the total of 1), 2) and 3))

Of these categories, questions relating to the amount, frequency, frequency of payments, and annualized payment were asked. The surveyors calculated the total annual income by aggregating the annualized payments. In order to make them less conspicuous, questions relating to private practice income were not posed in a separate section but as one of questions about income of health workers, because private practice was not totally allowed.

Questions relating to income from employment earned by household members included questions about income from their secondary jobs because of the tendency of Cambodians to maximize income earning opportunities (Ebihara 1968; Ministry of Planning, Cambodia and UNDP, 2007).

In relation to income from sources other than health work, questions were asked about the three most important household enterprises, their total income and expenditure and net income or net-loss (expenditure) in terms of their contribution to the household budget. However, a hypothesis for the household enterprise was that they did not bring about net-income or net-loss with significant level to the household economy, because the main income of the household was likely to be income from health work obtained by the health workers.

Hypothesis about the four main variables are as follows:

a. Incomes from health work excluding private practice (income in the government sector)

This category of income was hypothesised to reflect income increases directly from the payments associated with the contracting settings. The share from user-fee income was highly likely to increase in correspondence with the projected increases in service delivery in the contracting settings. This category of income was hypothesised to be higher in the Operational Districts contracted out: CODs than in the Operational District under MOH management: MODs. The proportion of this category of income to the total household income in CODs was projected to be higher than in MODs, thanks to the payments associated with the contracting settings. The increases and proportional changes were expected to show a labour supply increase in the government sector and labour supply transfer from the private to the government sector.

Descriptive statistics of this category of income were likely to show a level of economic benefit from DFID/World Bank Contracting Project, when it was compared with the same category of income in MODs.

b. Private practice

Their private practice income was likely to decrease in CODs, if the payments paid in the contracting were a meaningful amount to the health worker and their household. Difference in the proportion was likely to indicate the importance of this income to health workers in

CODs and MODs. Comparisons of its proportion to the total household income in CODs and MODs were hypothesised to show a transfer of labour supply from the private to the government sector.

c. Income from sources other than health work

It was important to obtain information on this category of income since this study considers that the impact of the incentive in the contracting setting needed to be evaluated in relation to its implications for the total household income. This was based on the hypothesis that the health workers had sources of income other than health work and that incomes of health workers and of their households were intricately connected to each other. Therefore, it was assumeded that income from sources other than health work might differ between CODs and MODs because of the payments associated with the contracting settings paid in CODs.

d. Total household income

The total household income was hypothesised to be higher in CODs than in MODs, since the payments associated with the contracting settings might contribute largely to making thetotal income higher in CODs than MODs. The higher income might have been brought by a hypothesised situation that the level of payments associated with the contracting settings were designed to have sufficient impact on income in order to change health workers' behaviour. The higher income in CODs might have resulted in despite that private practice income or income from sources other than health work might have contribute more significantly to the total household income in MODs than in CODs.

2) Other incomes

Other incomes asked about were selected, drawing on previous nation-wide surveys (Statistic Canada 2000; U. S. Census Bureau 2000; Australian Bureau of Statistics 2001 in Luxemburg Income Study), information from the key informant and literature. Details about savings were not requested because of the low development of banking systems in Cambodia and the tendency among Cambodians described above. Questions about the possession of gold and jewellery by the households as a means of saving (Ebihara 1968) were not asked in consideration for Cambodian security issues; people were afraid of thieves if they revealed ownership of such possessions. However, the relatively widespread social custom of a saving group, the 'Tontine', was inquired about. Regular monthly payments to funeral clubs were also inquired about (KI15 May 2 2007).

(4) Household expenditure survey

The main purpose of the measurement of household expenditure was to derive evidence supporting increases in the income of health workers and their households in CODs and proportional changes in the incomes.

1) Important variables to be collected and hypothesis about them

a. Food expenditure

The proportion of food expenditure to the total household expenditure differentiates the economic status of households. The economic status is compared by application of the Engle's Law (Mankiw 2011) which maintains that the proportion of food expenditure to the total household income decreases according to increases in the income. The proportion in CODs were hypothesised to be lower than in MODs, because of the higher economic status of households in CODs raised by the payments associated with the contracting settings.

b. Educational expenditure

Educational expenditure was considered as one of the main expenditures for signifying the economic status of the surveyed household (Bollen 2001; McPake et al. 1996; World Bank 2007; Badloe et al. 2007). The current access level to educational services is regarded as one of the most important non-monetary indicators showing the current economic status of households (Bollen 2001; McPake et al. 1996; World Bank 2007; Badloe et al. 2007). In Cambodia, rates of school enrolment of children were strongly associated with the socio-economic status of the household (World Bank 2006; Badloe et al. 2007). Therefore, the educational expenditure of the household in CODs was hypothesised to be higher than in MODs because the household could afford higher expenditure due to their raised income resulting from the payments associated with the contracting settings.

c. Access to basic infrastructure, housing materials, possession of durable goods

Variables regarding access to basic infrastructure, housing materials and the ownership of assets contribute not only to estimating total income, but also to exploring differences in household economic status (Baulch and McCulloch 1998; World Bank 1999; Turton 2000; Hanson et al 2009; Vyas and Kumaranayake 2006). The variables in the questionnaire drew predominately on the CSES 2004. However, adjustments were made, reflecting findings from the key informant interviews and personal observation such as inclusion of decorative wood furniture made of highly valued tropical woods (personal observation) such as Dalbergia bariensis **(**Ma and Broadhead 2002).

2) Other expenditure

Questions about other expenditure items drew mainly on the LSMS survey.

3) Issue s of measuring household expenditure and coping measures

Measuring household expenditure still raises practical and conceptual problems (Deaton 1997), thus, this study employed coping measures to minimise them.
The measures concerned recall period, accuracy of reporting, level of disaggregation and errors of imputation.

Recall errors of expenditures are inevitable. If the recall period is longer, respondents tend to forget their consumption; this means recalled expenditures tend to be reported as less than actual ones. In contrast, short-term recall periods bring in higher expenditures than long-term recall periods but overestimations of variance of the expenditures. Additionally, errors of reporting expenditures that were actually incurred in the previous term may be reported in the present term (‘boundary problem’) (Deaton 1997).

A monthly recall period has often been considered too long for ordinary households in LMICs where receipts and bank statements are rarely used (Deaton 1997). This study reflected the frequency of consumption of items in order to ensure appropriate recall periods (Devereux et al. 2004) and tended to apply shorter-term recall periods in order to avoid the ‘boundary problem’ (Deaton 1997). The recall periods of food expenditure were the previous week of the survey and a typical week. The typical weekly expenditure reduced possible anomalies in the previous week’s expenditure.

Household expenditures also tend to change according to season, particularly in LMICs (Deaton 1997). Some farming households may consume all the rice of their home production and may need to buy rice immediately before harvest. Households may also spend money disproportionately against their total expenditure for an annual festival such as New Year (The World Bank Poverty and Human Resources Division. 2001). However, as noted in Table 4.3, the reference time of household expenditure surveys is normally set for one year, in which seasonal variations are absorbed (Deaton 1997). This study therefore used a one-year reference time.

Respondents of household expenditure surveys are frequently reluctant or refuse to report their expenditure accurately (Deaton 1997). Disaggregating questions of expenditure, using

various sources of information for triangulation reduces this problem (Casley and Lury 1987). Answers to disaggregated questions are calculated or imputed and could be transformed into expenditure items by type or area such as educational expenditures (Deaton 1997). This study accommodated any potential reluctance by disaggregating questions.

However, disaggregation would make the questionnaire survey longer in both the number of questions and the time required to complete. The World Bank's LSMS sets an interview time of "two to three hours" as a "practical" length for obtaining the data (Deaton 1997). This study set the guideline maximum time of 2 hours for asking the survey questions.

Imputations are made by using collected data or non-collected existing data based on theories, in order to increase the accuracy of figures for expenditure. However, errors of imputation unavoidably occur (Deaton 1997). To reduce these errors, this survey checked errors in imputations during the data collection and before data input.

Capturing accurate food expenditure was achieved by asking questions about expenditures on food items reflecting the national and rural context (Chambers 1997; Mosse 1994) including estimated-prices of foods produced by the respondent households' own efforts and consumed. Food items (N=66) were selected by drawing on the CSES 2004 (National Institute of Statistics 2005) and an investigation of the poverty line in Cambodia (Ministry of Planning, 2006). The 66 items were considered as sufficient to understand food expenditure.

4) Sections of questionnaire sheets.

Employing the coping measures and reflecting the importance of variables, the following sections and sub-sections were set up with specific purposes and strategically structured (Table 4.6.1 and 4.6.2). The questionnaire was asked in Khmer language. Questionnaire sheets in English were attached in Appendix Part II. Most questions were intended to determine, or estimate, expenditure on goods and services in the 12 months previous to the time of the survey (Deaton 1997).

Table 4.6.1 Sections, sub-sections, purposes, and the main items of the questions

Sections and sub-sections (number of questions)	**Purpose and Question items (example)**
Face sheet (20)	**To list basic information of the government health worker, administrative information of the household, surveyors, etc.**
0. Household information	**To obtain basic information about household members**
0A: Household member roster (12)	Name, age, sex, relation to head of household, occupation
0B: Occupation (7)	Employed or unemployed, nature and place of employment
0C: Migrations (3)	Previous place of residence, length of residence, reason for migration.
1. Education	**To ascertain the level of education, educational expenditures**
1A: Information (6)	Completed education, current enrolment (details, grade), and location of schools
1B: Expenditure (9)	Tuition, books, transportation, expenditures on examination preparation, support for schooling of children away from home
2. Health	**To obtain expenditure for health services**
2A: Chronic disease and last illness or injury (9)	Nature of illness or injury, expenditure on consultation, drugs, transportation and lodging
2B: Last maternal care (8)	Expenditure on consultation, drugs, transportation and lodging. (including delivery) (for the last 12 months)
3. Employment (income)	**To know the income of government health workers and of other household members who were employed**
3A: Income from main job including in-kind income (6)	Sources, regular payment, performance based payment supplemental salaries, bonuses, , frequency, amount, annual payment
3B: Income from the secondary job including in-kind income (6)	Same as above.
4. Housing	**To obtain information about dwelling (materials, facilities, construction price, etc.), expenditures on utilities**
4A: Type (5)	Ownership: own, sharing, renting
4B: Characteristics and expenditure (7)	Size and materials of house
4C: Utilities and facilities (9)	Sources or types and charges of utilities (water, electricity, etc.)
4D: Construction and price of housing (7)	Year of construction, additional construction or maintenance works, costs for maintenance, price of housing plot

Table 4.6.2 Sections, sub-sections, purposes, and the main items of the questions

5. Agricultural	**To outline the activities of the household, net income or net expenditure**
5A: Agriculture (10)	Land, kinds of production, home consumption, sales, expenditure on inputs (fertilizer, paid labour, etc.)
5B: Forestry and/or fishery (5)	The same as above.
5C: Livestock (10)	Kinds and amount of production, sales, purchasing, and home consumption, and expenditure on inputs (feed, veterinary services, etc).
5D: Machinery and implements (2)	Ownership, purchasing, sales and resale prices and leasing.
6. Non-farm self-employment (6)	**To outline the activities of the household, net income or net expenditure.** The three most important types of enterprise, gross income, expenditure on inputs, net income.
7. Food-expenditure (18)** (66 items, 7)	**To ascertain food expenditures by kind and by mode (purchasing, consumption of home production).**Rice and other staple foods, vegetables, fruits, meat, fish, seasonings, oil, alcoholic and non-alcoholic beverages, tobacco products.
8. Non-food and durable goods	**To know non-food daily and annual expenditures and possession of durable goods.**
8A: 'Non-food daily' expenditure (13 items, 3)	13 categories of items: wood for cooking; gas or kerosene for cooking; soap or shampoo or toothpastes or other toiletries ; insecticide or spray or moths quite coils; haircut or hairdressing; dish-wash or laundry detergent; gasoline for motorbike and car for individuals (not business) use; transportation service for individuals (motorbike, chicro, buses and trucks); newspapers or stationary for home use; pocket money for children for special occasion such as ceremonies excluding that spent on foods bought at school; entertainment; wage to home servants; others to be specified.
8B: 'Non-food Annual' expenditure (10 items, 3)	10 categories of items: clothes or underwear or fabric; footwear; hat or umbrella; towels or Cromer; bags; plates or cups or pans; light bulbs or batteries; materials for minor repair or maintenance of housing; wedding or funeral; others to be specified (e.g. toys).
8C: Durable goods: Ownership (20)	Radio, TV, mobile phone, electric fan, motorbike, bicycle, purchase price, resale price.
8D: Gifts and others	Money and in-kind to other households, financial donations.
9. Income and received remittance (6)	**To ascertain inflow of cash or goods to the household, not connected to employment or any household enterprise** Pensions and social transfers, rent of building or equipment, sale of assets, interest on savings, remittance
10. Borrowing, lending, and saving (5)	**To ascertain flows of cash or goods as loans or lending between the household and the outside, or those of savings** Amount, participation and payments in savings groups or funeral clubs.

Some parts of the questionnaire alternate sections on income with those on expenditures, while others have sections specifically related to either income or expenditure, in order to prompt the respondent to recall the income or expenditure more accurately.

Most of the questions, except those asking for details of specific monetary amounts, had multiple reply options. This was to avoid the replies of "I do not know" or "(unspecified) others," which may, in fact, be due to the reluctance of the respondent to find out or accurately provide the real figure. Some questions were specifically formulated and asked in a particular order to encourage the respondent to recall.

5)Strategy for collecting cases: number of cases chosen for a complete survey

This study intended to obtain a sufficient number of cases in order to ensure the regression analyses (the regression method and objectives are explained below) with the robustness and the appropriate effect size (Cohen 1992), employing the quasi-experimental cross-sectional design. Therefore, this study chose to conduct a survey with complete enumeration (Milligan and Njie 2004) which requires the collection of data on all cases in the survey population. In the health sector in LMICs, household surveys have been frequently conducted without employing an inclusive sampling frame. They benefitted by such an approach's advantage of the time and expenditure necessary for setting up the sampling framework and implementing the survey according to the framework (Milligan and Njie 2004). Therefore, these benefits were expected to be obtained by this study. In addition, there were expected benefits from a complete enumeration to this study as follows.

The complete enumeration was suitable for the Cambodian health sector settings, rural settings, and other unpredictable incidents in securing the number of cases predefined or calculated as the sample number. Even obtaining accurate but basic demographic data about health workers in the Operational Districts contracted out proved very difficult, suggesting that obtaining such data of non-contracting out Operational Districts was futhre difficult. The information was necessary to developing a sampling strategy. The unpredictable incidents included problematic weather or disturbed transportation; and/or non-cooperation by the respondents during the data collection. These things were anticipated to reduce the number of cases collected. However, cautious treatments were necessary for expanding application of the result of statistical analyses to other health workers outside of the study subject.

While employing the complete enumeration method, this study had a case selection approach for respondents of the questionnaire which strengthened the validity of the quantitative investigation of this study. The case selection approach set selection criteria for respondent health workers. They were framed by the district coordinates as contracted out or non-contracted out and elaborated by theoretically set-up eligibility for individual health workers as below.

Criteria for the respondents (health workers): they must have an official government post and have worked for at least two years at the time of the survey. They must not be temporary staff. They must have had experience in receiving government salaries continually, including performance-based payments (only in Districts contracted-out). Some members of the health workers household were also respondents but only those who were likely to be the most knowledgeable about a given subject area of questions. They were named by the health workers and asked about the specific area. For example, food expenditures were mostly asked of the female member of the household, most often the wife of the health worker, who actually purchases the household food supply.

Employing the complete enumeration appropriately reflected issues of the so-called "ghost" health workers. The "ghost" health workers' names were on the list of current employees but they were not actually working for various reasons, e.g., receiving government salaries by appearing at the work place only on pay days (KI15, March 15, 2007). This study cautiously avoided counting the so-called "ghost" health workers as eligible respondents before the survey implementation.

Due the resource constraints of this study, 300 cases were regarded as the maximum number of cases to be collected. However, the number of eligible (and therefore collected) cases was predicted to be 200 to 250 from calculations and this number was expected to give the statistical validity (Salkind 2004) required for analysis for the second research question. The calculations were made based on an assumption that each Health Centre was reported as having 4 to 5 eligible health workers; and 80% of the existing Health Centres in CODs and MODs were physically accessible, i.e., 4 to 5 health workers multiplied by 51.2 Heath Centres (the total number of Health Csentres: 64 (MOH 2002) X 80%).

The statistical requirements from regression analyses gave the number of cases identified as follows. Tabachnick and Fidell (2001) maintain a 'rule of thumb' for: a) testing multiple correlation, and b) testing individual coefficients as follows:

a) $N \geq 50 + 8m$;

b) $N \geq 104 + m$,

where *m* = the number of independent variables (Tabachnick and Fidell, 2001, p. 117). This study intended to use the attributes of health workers as independent variables. The number of possible attributes to be used was estimated at less than 10. Thus, substituting 10 in *m* in the formula a) and b),

a) obtains $N \geq 50 + 8 \times 10$, and

b) obtains $N \geq 104 + 10$.

When the distribution of the dependent variable is skewed, a rule of thumb for the sample size is:

$$N \geq (8/f^2) + (m - 1),$$

Where $f^2 = effect, and\ 0.01, 0.15, 0.35$ (for small effect, medium effect, and large effect) (Tabachnick and Fidell, 2001, p. 117), substituting these three numbers and 10 as the number of independent variables, the formula obtains, 809, 62, and 32 (rounded into real numbers) respectively. Due to the resource constraints of this study, collecting the 809 cases specified by this calculation, which would give a suitable test with small effect, was impossible. Instead, achieving the second best figure (62), the requirement for testing with medium effect, was aimed for.

6) Organisation of fieldwork

Local knowledge is important as the base of researches in practice and studies in development in a rural context (Chambers 1997; Mosse. 1994). Promoting the participation of the respondents contributes to the acquisition of more accurate data and to the efficient conduct of the survey in LMICs (Casley and Lury 1987). In order to increase the understanding, cooperation and participation from local health organisations and health workers, this study was introduced by the University of Health Science in Cambodia. The

university was the only national medical university and has an influence on local health administration, to the Office of CODs and MODs, and to the Provincial Health Department (PHDs) of Prey Veng and Takeo Provinces. This protocol was considered suitable for the hierarchical and centralized authority in the government health system. In person, the investigator provided detailed explanations of the field work and the study to Managers of CODs and MODs, the two PHDs; and Managers of Health Centres.

The investigator also increased in linguistic competence before the period which contributed to the elaboration of the questionnaire and the data collection. The investigator studied the Khmer language for a period of 4 months in Cambodia, focusing on the words, expressions, and concepts relating to this study.

Furthermore, to assure the competence of the survey data collection, this study commissioned a local NGO, CEDAC (the Cambodian Centre for Study and Development in Agriculture) to undertake the data collection of the household survey. CEDAC, which was established in 1997, is one of the most experienced NGOs in Cambodia regarding social and rural development and socio-economic surveys and has worked with UN and bilateral cooperation organisations. CEDAC has been supporting a large number of farmers in their forming cooperatives. A senior Cambodian staff of CEDAC had a good knowledge and experience of rural Cambodian livelihoods and household economics. Their knowledge and experiences strengthened the quality of the questionnaire survey and made it more culturally appropriate to the context. The investigator had a close working experience with CEDAC, from 2001, in a project of the Japanese government; hence, there was a first-hand knowledge of the capacity of CEDAC staff.

Two Cambodian staff members of CEDAC worked with this project: one as Project Manager (the Project Manager of the commissioned project to CEDAC); another as Field Supervisor.

The support CEDAC provided was:
- Support for developing the questionnaire and conducting the pilot test;
- Recruitment and training (in co-operation with the investigator) of surveyors and the Field Editor;
- Scheduling, supervising, on-site training and reporting on data collection;
- Creation of database, and editing and entering of data.

The Survey Team which collected data consisted of: a Field Supervisor; Field Editor; Six Surveyors (three pairs: one male and one female for each pair). Considering the gender influence in Cambodia (UNIFEM 2004), the female surveyors asked questions to female respondents when they were providing information about expenditure on items, e.g, food or clothes, of which purchasing is generally regarded as a female responsibility (USAID 2006).

7). Processes and flow – household survey

Table 4.7 shows the processes of the fieldwork. Although the processes are numbered here, some of them advanced or proceeded in parallel as opposed to sequentially. The main tasks in each process and flow of processes are shown in Appendix 4**.**

Table 4.7 Processes and main tasks of household survey

Processes
1. Development of questionnaire
2. Translation of the questionnaire
3. Pilot test
4. Revision of questionnaires
5. Recruitment of surveyors
6. Training of surveyors
7. Finalising questionnaire
8. Creating database for data entry
9. Introduction of data collection Provincial and District Health Offices
10. Identifying eligible respondents
11. Data collection
12. Editing data collected
13. Entering data

a. Development and translation of questionnaire

Since the data collection uses both the Khmer (for the asking of questions and filling the questionnaire sheet) and English languages, in order to achieve reasonable quality in translation between the two languages, this survey applied back-translations to the questionnaire (Lee and Yom 2007). Also, since researchers for a study employing questionnaire survey have a substantial understanding of the content and structure of the questionnaire, they are to contribute to correct translation (Roberts et al. 2007). The Field

Supervisor of the data collection (CEDAC staff), who also had knowledge and experiences of rural livelihood researches, were involved in the wording of the translation of the original English version into Khmer. This enhanced the quality of questionnaire. The Khmer translation was brought to a professional translator for re-translating back into English (back-translation). The investigator compared the two versions, clarified the Khmer language questions with the Field Supervisor and translator and corrected some words and expressions.

b. Pilot test

The pilot test was conducted at a Health Centre in a District in a rural setting in Kandal Province, outside the study site. The subjects for this test well reflected the subjects of the current study including: health workers of both genders, those with involvement in dual practice and their household members. The investigator, Project Manager and the Field Supervisor observed the pilot test and reviewed the collected data to determine whether anything had to be stressed within the training of the surveyors. The questionnaire was revised according to the findings from the pilot test.

c. Recruitment and training of surveyors

Steps taken in recruiting the surveyors and training of them ensured the quality of data collection. Announcement of the recruitment was posted at the locations (Appendix 5) where qualified university students and researchers would see it; including the national institutes where nation-wide household surveys are administered. Shortlisting (from 128 applicants), a written test, and formal interviews were then conducted. The surveyors were trained in a training course (Appendix 5) and field practice (a Health Centre in Kandal Province).

d. Identifying eligible respondents

The number of eligible health workers for the survey was identified by the investigator by using information collected directly from the Chief of each of the Districts. However, immediately before and after the start of data collection, some of the eligible health workers were identified as unavailable by the District Office, so that a decrease in the number of subject cases occurred. Further explanation will be provided in Section 6.2.

e. Data collection

The data collection was undertaken in the 5 Districts from the 18th of June to the 15th of July 2007. The 6 surveyors, in three pairs (one male, and one female in each) conducted the interviews either at Health Centres or the houses of the health workers. Debriefing and

feedback sessions were held almost daily. Supervisory visits by the investigator and field training by the Project Manager enhanced the data collection process.

f. Data checking, editing and data entry

Errors in writing, miscalculations, imputations, and other errors in the collected questionnaire sheets were checked, confirmed and corrected by the Field Editor and the Field Supervisor before the data entry. Data was double entered in an ACCESS (Microsoft ACCESS 2003) data-base. After entering, the investigator compared the two sets of data and corrected the anomalies. Then, the data was transferred to SPSS**.** These repeated checks increased the accuracy of the date entry.

8) Data analysis

a. Aggregation of household survey data

Income items were divided into aggregated and non-aggregated ones and then aggregated, drawing on the approaches of the Luxemburg Income Study (Luxemburg Income study [online] 2010), with reference to LSMS (Grosh and Muňoz 1996). After this, they were categorized into sub-categories and were aggregated within the sub-categories, according to hypothesis.

Regarding the methods of aggregation of expenditures, the consensus of economic theorists is limited; furthermore, different surveys have devised different methods (Grosh and Muňoz 1996). This study drew on the LSMS approach, which is a "relatively non-controversial approach" (Grosh and Muňoz 1996, p. 270). This is accomplished by modifying it to the Cambodian context.

Saving and investment (e.g., investment in stocks, bonds, property, and household enterprises) were excluded (World Bank Poverty and Human Resource Division 2001) from the aggregation. Categories for aggregation of expenditure items are therefore:
1) food; 2) ‘non-food daily’ 3) ‘non-food annual’ expenditures; 4) education; 5) health services; 6) utilities 7) rent; 8) economic activities other than health work (net expenditure incurred by household enterprises).

Access to basic infrastructure, housing materials, and the possession of durable goods were analysed as follows. The proportion of the households which possessed the durable goods was calculated against the total number of households in both CODs and MODs and in each district. The proportions were compared:

1) with results of CSES and 2) between CODs and MODs.

The comparison with the national level data distinguishes difference between clearly through comparing them with data by household economic quintile or geographical grouping, as is common to the area of development studies and practice (World Bank 2005).

b. Descriptive statistical analyses and statistical tests of differences between CODs and MODs[1]

Based on the hypotheses of this study and about variables described above, descriptive statistical analyses were intended primarily to compare incomes and expenditures between CODs and MODs and proportional changes in incomes associated with the contracting settings in CODs. The analyses had other purposes as well, to provide variables for the regression analyses and to show the relative importance of variables and the data structure which the regression analyses. The mean, median, and standard deviation were calculated on the income and expenditure and their subcategories of incomes and expenditures by tabulating or cross- tabulating them.

The following variables for incomes were compared between CODs and MODs,

1) Category: incomes from health work excluding private practice
Government regular payments
Performance based payments (paid only in CODs)
Supplementary salaries from NGOs and/or donors
Per-diems
Honorarium for giving training or lectures
Share from user-fee income;
Total household income

2) Category: Private practice income
Private practice income

3) Category: Incomes from sources other than health work

[1] Software used were SPSS 12, 15, 16, 17.

Incomes from sources other than health work such as agriculture

In addition, the following categories of incomes were compared.
- Income from the health work excluding private practice as the total of the category
- Income from health work including private practice (the total of 1) and 2) above)

The Income from health work including private practice was highly likely to reflect the magnitude of the importance to the health worker of income from health work.
The household expenditures were compared by expenditure category the aggregation employed.

Tabulating or cross- tabulating were made by:
1) Status of the district: whether it was a COD or a MOD,
2) District (the five districts: Pereang; Preah Sdach, Kirivong Kamchy Mea, Mesang,)
3) Cadre
4) Gender
5) Cadre by district

In order to protect confidentiality and anonymity of assistant doctors and doctors whose total number was less than 10, only selected income and expenditure data for assistant doctors and doctors were disclosed.

If the same type of variables employed in this study descriptive statistical analyses were available in nation-wide data, such as CSEC 2004, or studies based on the CSES 2004 data, or other studies relevant to this study, these variables were also compared.

Mann-Whitney U test

Data of six subcategory-incomes, that of seven subcategory-expenditures and the total household income and expenditure (not in the log-transformed form) were tested by the Mann-Whitney U statistical test, in order to investigate whether the data differences between CODs and MODs was significant (p-value <0.05, two-tailed). The subcategories were:
Incomes:
1) government regular payments, 2) supplementary salaries and per-diems,
3) share from user-fee income, 4) income from private practice,
5) incomes from sources other than health work,
6) Total household income.
Expenditures on:

1) food, 2) ‘non-food daily’, 3) ‘non-food annual’,
4) education, 5) education received by children away from household,
6) health services, 7) total household expenditure.

The Mann-Whitney U test examines difference between two non-parametric data. The test was suitable to the income and expenditure data of this study.

(5) Regression analyses for exploring the imapact of payments

This study employed linear regression analyses to explore the association between contracting setting and health workers’ income and household expenditure. The regressions analyses were performed in two sets of cases of health workers. One set consisted of two groups: health workers who belonged to CODs and MODs (N = 250). Another set consisted three cadre groups in the same health workers: primary nurses (N = 117), secondary nurses (N = 64) and midwives (N =.61). The second set was expected to clarify and confirm the impact of payment presented in the analyses of the first set. This is because controlling for cadre, a potentially influential factor relating to changes in health worker income, in the second set was likely to further elaborate the impact of payments with other potentially influential factors.. The possibility of matching the cases based on health workers demographic attributes failed due small numbers of matched cases (Appendix 8).

Regression analysis is a statistical technique for estimating the equation, which has the best suited sets of observations of dependent and independent variables, in order to obtain the best estimate of the relationship between these variables (Pass et al. 2005). Regression analyses “attempt(s) to understand or explain the nature of phenomena for purposes of testing or development theories” (Licht 1995 p. 21). Studies compare, by employing regression analyses, the effects of independent variables to the dependent variable (Durmont et at. 2008; Mullahy 2009; Channo and Padmadas 2008; Ensor et al. 2009).

Because these functions of regression analyses, this study employed regression analyses in order to explore the impact of performance based payments based on the hypothesis about the impact on health workers’ income.

Regression analyses also benefit studies which “attempt to predict events or behaviour for practical decision-making purposes in applied settings” (Licht 1995 p. 21). However, this function has little relevance to this study whose purpose is not to identify the best model for prediction.

Multivariate linear regressions associate a continuous dependent variable with more than one variable (independent variables) on an assumption of a linear relation between the two groups of variables (Channo and Padmadas 2008). Assumption of liner regressions consisted of four aspects: linearity, normality, independence, and homoscedasticity as below. However, the independence concerns time-series data and since this study did not have times-series analyses, three other aspects are explained.

Linearity refers to the linearity between independent and dependent variables. Normality for regression analyses refers to distribution of the error (residuals). The residuals (the error) in the population must be normally distributed (Field 2005). Normality in statistical analyses also frequently refers to normal distribution of variables (distribution of sampling) (Field 2005).

Data of household incomes and expenditure like the data of this study are generally characterised by being highly-skewed and having a long right-tail and relatively large portion of nil-value-cases to the total cases (Amemiya 1985; Deaton 1997, Fagiolo et al. 2007; Mullahy 2009). The household income and expenditure data of this study has this highly skewed structure.

Also, influence of the outliers is inevitable in household income and expenditures (Amemiya 1985; Fagiolo et al. 2007; Mullahy 2009). Total household expenditure often did not increase linearly and the increase rate changes before and after children became adults (Office for National Statistics 2005). These features are highly likely to affect the linearity and the normality.

In order to response these issues (the normality issue here is the one concerning distribution of sampling), this study transformed incomes and expenditure to natural logarithm and included a variable for age squared for adjusting the linearity.

After this treatment, this study tested the linearity by plotting the expected normal value of the dependent variables (the incomes and expenditure) (Y-axis) and the observed value (X-axis) and checked the normality of log-natural transformed variables (Field 2009).

Coefficients of dummy variables obtained from the regression analyses were computed, in

order to give "the exact percentage difference in the predicted dependent" variable, in comparison with the reference variable. This computation "(e)xponentiates " the coefficient and "subtracting one" (Wooldbridge 2009. P.232) :

exp (coefficient) -1.

This study investigated the heteroscedasticity of models by 1) checking visually plot of the regression standardised residuals versus the regression standardized value and 2) employing the modified White test. SPSS does not have the White test in its default setting which tests the hetroscedasticity[2]. As a result, this study conducted the modified version of the White test (Economic History, History Department, Oxford University accessed April 8, 2013) by applying the syntaxes of the modified version (Appendix 7).

For the plots, if bimodality was presented, further tests were conducted to confirm whether COD, the variable, was the main factor which caused the bimodality The test methods and examples[3] of data produced by the tests were described and presented in Appendix 8.

1) Dependent variables

Following variables were selected as dependent variables based on the hypothesis described in the subsection for the household income survey above. Expression of variables are presented in Chapter 7. Some of them were the subject of descriptive statistical analyses and others were derived from the result of the descriptive statistical analyses or the key information interviews.

The dependent variables consisted of different types of income reasonably reflected the hypothesis of the health workers' having different income sources. Investigating the impact of incentives to these different incomes was expected to elaborate implications of the impact, consequently, contrast the effect of payments associated with the contracting settings.

1) Income from health work excluding private practice
The income from health work included the payments associated with the contracting settings (but only in CODs).
2) Income from health work including private practice

[2] SPSS users frequently employ the scattered plot for examining the hetroscedasticity.
[3] Test data not included in Appendix 8 are provided by the investigator upon request.

This category of income includes and reflects private practice income. Since private practice income was assumed not to be earned by all health workers, the private practice income was excluded from the dependent variables. Therefore, the income from health work including private practice is important to exploring the payments associated with the contracting settings.

3) Total household income

This income category was comprised of income from health work and non-health work. These two incomes were assumed to be intricately connected with each other in the incentive environment.

Regression results of the total household income were hypothesised to reflect the impact of the payments associated with the contracting settings and implication of the income from non-health work in relation to other factors which were hypothesised to influence the total household income. The total household income was highly likely to be influenced by exogenous factors outside of the DFID/World Bank Contracting Project, such as the economic status.

4) Total household expenditure

Regression results of the total household expenditure of this income were hypothesised to reflect the impact of payments associated with the contracting settings to the household economic status. This is because household expenditures seemed to reflect the economic status more accurately than household incomes (Deaton 1998).

2) Independent variables

Independent variables were theoretically selected based on hypothesis concerning the incentive environment of DIFD/World Bank Project and hypothesis derived from descriptive statistical analyses and the key informant interviews. Definitions and expressions are described in Table 4.8 placed at the end of this section. Additional details of hypothesis for independent variables are explained in the result chapter.

1) Status of the district as districts contracted out. Another status was districts managed by MOH. The contracted out status was hypothesized to reflect differences brought about by the payments associated with the contacting setting between CODs and MODs. This is the variable of core interest to this study.

2) Economic status of the five districts

CODs and MODs were selected as they were considered to have similarities which would accommodate the comparison of the impact of the contracting payments in the quasi-experimental settings. However, it is important to test an assumption that the economic status of the district was likely to influence on the income from dual practice and the total household expenditure through prices of goods and services.

3) Degree of the prohibition of dual practice by NGO Contractors

The degree of the prohibition of dual practice by NGO Contractors was hypothesised to influence private practice income and indirectly other incomes and the total household expenditure through the magnitude of private practice income against other incomes. The DFID/World Bank Project contracting agreement intended health workers' abstaining from dual practice (Chapter 3). The degree was measured as follows, in order to tranform them into an independent variable. Three degrees were identified among CODs and MODs. However, further details of the prohibitions by the NGO Contractors which were derived the key informant interviews were presented in a result chapter (Chapter 5).

The prohibition rules of the MOH that were applied during the field work period (2007) were used as the baseline and provided the basis of comparison with the prohibitions applied by the three NGO Contractors. The MOH rules prohibited dual practice during working hours and duty hours but appeared to have limited effect in restraining health workers from conducting dual practice (Soeters and Griffiths 2003; Akashi et al. 2002). The MOH rules were applied by non-contracting Operational Districts including MODs.

Using the MOH rules as the baseline, differences in strengths of prohibitions by the three NGO Contractors were investigated. Information and experiences about the prohibitions by the NGO contractors were obtained by the key informant interviews and were compared with the MOH rules. The comparisons were made about the hours of prohibitions and other aspects such as the intensity or additions of rules, punishments and prohibitions of health-related private business, for example, operating pharmacies by the health workers or their households.

Among CODs, RHAC applied the MOH's rule in Prea Sdach Operational Districts, as a result, the degree of RHAC's prohibition was perceived to be the same as the MOH baseline. The SRC in Kirivong Operational Districts, while applying the same working hour

prohibition as the MOH, imposed their own internal rules which included punihments such as reductions of payments. Because of this feature, SRC's prohibition was considered stricter than the MOH's rules. HNI's prohibition in Peareang Operational Districts, however, appeared to be even stricter than RHAC and SRC. HNI prohibited dual practice completely as well as family members' medical practice or conducting pharmacy business. HNI also imposed internal rules which included punishments. Some of the punishments appeared to be heavier than SRC's; the punishments included the immediate transfer of the health worker who conducted private practice to another health facility (Jacobs and Price 2006; Jacobs et al. 2010; SRC 2006; KI01 and KI02 in 2006, KI10, 2007). As a result, HNI's prohibition was considered the strictest among the three NGO Contractors. Consequently, three different degrees were identified: low level equivalent to the MOH rule applied by RHAC and two MODs, middle level applied by SRC, and the strictest level applied by HNI. These three levels were expressed by binary dummy variables (Table 4.8).The rules are explained in Chapter 5.

4) Variables for the five subject districts were intended to represent inclusive differences among them. The differences might have influenced the incomes and expenditure through the incomes of health workers which, in turn, were influenced by the economic status.

5) Attributes of individual health workers

The payments which were basically the scheme of fee-for-services and previous studies and the contracting document did not appear to indicate these attributes of individual health workers as determinants on the payments (ADB 2002b; MOH 2001;KI02, Feburary 27 2006; K01, March 17 2006; KI04, April 22 2005). Controlling for them in regressions in this study was expected to elaborate the effect of the payments and other variables which appeared relevant to the changes in incomes in CODs.

Cadre

The cadre with higher qualifications was likely to bring in higher government salaries and income from private practice (MOH 2005). Cadre was likely to influence the health workers' payments associated with the contracting settings. This hypothesis was derived from the result of the key informant interview of this study. It was found that cadre was considered in the payment guideline of NGOs and the allocation methods at Health Centers.

Gender

Gender seemed to be a determining factor for entry "(UNIFEM 2004)" into some cadres such as doctors and midwives. Therefore, gender may influence health workers' and their households' income and expenditure through the cadre.

Age and age squared

Age was likely to correlate to the income of health workers, often being translated into the seniority in the government regular payments and with the number of years of experience influencing the demand for private services provided by the health worker and consequently his or her private practice income (Ensor et al 2009). The age data was squared and both this age squared and age variables were entered in regressions of total household expenditure, reflecting that household expenditure generally did not increase in linearly (Office for National Statistics 2005). However, the health workers questioned by the survey were on active service, therefore, their age increases were likely to correspond to increases in the government and private service income. Data of age squared was employed in order to adjust the linearity since incomes might not hold the linearity as described above.

Household size

The number of household members was previously found to be correlated to the expenditure (Office for National Statistics 2005). Household size would affect the relationship between the income and expenditure, given the same income, household size could increase the expenditure. However, household size cannot offer a full explanation of either the expenditure nor income. Therefore, household size was not to be used as a crude proxy for the expenditure in this study. Incomes of household members, both from their employment and household enterrises, were requested in this survey as explained above, in order to ascertain the total household income.

Marital status

The marital status i.e. being married could be associated the possibility of the availability of a spouse's additional income to the household. However, marital status cannot offer a full explanation of either the income nor the expenditure of household. Therefore, marital status was not to be used as a crude proxy for the income and expenditure in this study. Incomes of household members, both from their employment and household enterrises, were requested in this survey, in order to ascertain the total household income.

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Table 4.8 Expressions and definitions of independent variables

Expression	Definition
OD Status	Status of districts: whether contracted out or not
COD	MOD=0, the reference variable
	COD=1
Cadre	Cadres,
Primary NS	Primary nurses, the reference variable =-00000
Secondary NS	Secondary nurses= 00001
Primary MW	Primary midwives = 00010
Secondary MW	Secondary midwives = 00100
Assis. Doctor	Assistant doctors = 01000
Doctor	
Gender	
Male	Female= 0, ther reference variable
	Male= 1
Household size	
HHSize	Household size of health workers
Age	
Age	Age of health worker
Age Squared	Age of health worker squared
Economic status	
EconoStatus	Economic status of districts based on poverty distribution map.
	Kirivong = 00, the reference variable, Lower eonomic status than Kirivong=01 (all other districts Peareang, Preah Sdachm, Kamchay Mea, Mesang)
Prohibiton of dual practice	Level of strength of prohibition of dual practice (details are in Chapter 5)
Prohibition dual practicce Strict	The strictest level in Peareang district (complete prohibition set by internal ruals with punishiments) =000, the reference variable
Prohibition dual practice Mid	The middle level in Peareang district (prohibition only within working hours set by internal rurle with punishment) =010
Prohibition Dual Practice Low	The weakest level (the same as the MOH rule) in Preah Sdach, Kamchay Mea and Mesang districts =001
Five Operational Districts	Nominal differences in the five districts
Kamchay Mea	Kamchay Mea (MOD) = 10000, Reference variable
Mesang	Mesang (MOD) = 01000
Prea Sdach	Preah Sdach (COD) = 00010
Kirivong	Kirivong (COD) = 00001
Peareang	Peareang (COD) = 00100

3) Empirical Models

Prior to the estimation, high collinearity between the variables was found. Due to this, some of these variables were excluded automatically by the SPSS default setting (tolerance of 0.0001) when all variables were entered together for regressing the incomes and expenditure. Combinations of variables which were not accepted by SPSS were:

1) The variable for the status of districts (COD) and those for the five districts,
2) The variables for the five districts and the variable for the economic status,
3) The variables for the five districts and those for the levels of strength of prohibitions,
Therefore, it was not possible to put together any of these three combinations in regressions.

In the next step, considering the above issues, two groups of variables were formed (Table 4.9). Neither of the two groups include any of the three combinations mentioned above.

The first group, Group A, intended to elaborate influence (coefficient) for CODs, the variable. This group avoided combination 1) above. Therefore, this group excluded the variables for the individual five Operational Districts but included all other variables. This group consisted of the variables for CODs, the economic status of ODs, the degree of prohibition of dual practice and attributes of health workers and their households (six attributes) (Table 4.8). However, these were still not able to give a calculation result due to the high correlation between two variables: economic status and the degree of prohibitions of dual practice, if all of them were put in together. As a result, in order to avoid grouping these two variables together, two separate models were formed from the variables in Group A. Model 1 included the economic status of Operational Districts and other Group A variables but excluded the degree of prohibitions of dual practice. Model 2 included the degree of prohibitions of dual practice and other Group A variables but excluded the economic status of Operational Districts.

Group B intended to elaborate influence (coefficient) for the five individual Operational Districts, the variables. Group B thus included variables other than CODs, economic status and prohibition rules. This group avoided the combinations of 2) and 3) above and consisted of the variables of the five individual Operational Districts and the attributes of health workers and their households (the six attributes)(Table 4.8).

These groups and model variables were entered by a SPSS method which enters all variables designated, i.e., forced–entering.

Table 4.9: Groups and models of independent variables (basic type)

Group A Model 1	Group A Model 2	Group B Model 3
Cadre, Male, Married, HHsize, Age, Age Squared, CODs, EcoStatus	Cadre, Male, Married, HHsize, Age, Age Squared, CODs, Prohibition dual practice Mid, Prohibition dual practice Low	Cadre, Male, Married, HHsize, Age, Age Squared, Measang, Peareang, Preah Sdach, Kirivong

Note: Variables above included the variables which were expressed in the form of dummy variables (Table 4.8).

Models for incomes are as follows,

Group A Model 1

$$\text{Ln}(Y_I) = a + b_1 \text{ HHsize} + b_2 \text{ Secondary NS} + b_3 \text{ Primary MW} + b_4 \text{ Secondary MW} + b_5 \text{ Assis. Doctors} + b_6 \text{ Doctors} + b_7 \text{ Age} + b_8 \text{ Age Squared} + b_9 \text{ Male} + b_{10} \text{ Married} + b_{11} \text{ COD} + b_{12} \text{ Economic Status} + e$$

Group A Model 2

$$\text{Ln}(Y_I) = a + b_1 \text{ HHsize} + b_2 \text{ Secondary NS} + b_3 \text{ Primary MW} + b_4 \text{ Secondary MW} + b_5 \text{ Assis. Doctors} + b_6 \text{ Doctor} + b_7 \text{ Age} + b_8 \text{ Age Squared} + b_9 \text{ Male} + b_{10} \text{ Married} + b_{11} \text{ COD} + b_{12} \text{ Prohibition dual practice Mid} + b_{13} \text{ Prohibition dual practice Low} + e$$

Group B Model 3

$$\text{Ln}(Y_I) = \text{Ln}(Y_I) = a + b_1 \text{ HHsize} + b_2 \text{ Secondary NS} + b_3 \text{ Primary MW} + b_4 \text{ Secondary MW} + b_5 \text{ Assis. Doctors} + b_6 \text{ Doctor} + b_7 \text{ Age} + b_8 \text{ Age Squared} + b_9 \text{ Male} + b_{10} \text{ Married} + b_{11} \text{ Measang} + b_{12} \text{ Peareng} + b_{13} \text{ Preah Sdach} + b_{14} \text{ Kirivong} + e$$

where Y_I means the categories of incomes explicated above, a is a constant, $b_{1..}$ b_t are coefficient for 1^{st} to t^{th} independent variables and e is error term.

Models for the total household expenditure was expressed as follows

Group A Model 1

Ln (Total HH Expenditure) = a + b_1 HHsize + b_2 Secondary NS + b_3 Primary MW + b_4 Secondary MW + b_5 Assis. Doctors + b_6 Doctor + b_7 Age + b_8 Age Squared + b_9 Male + b_{10} Married + b_{11} COD + b_{12} Economic Status + e

Group A Model 2

Ln (Total HH Expenditure) = a + b_1 HHsize + b_2 Secondary NS + b_3 Primary MW + b_4Secondary MW + b_5 Assis. Doctors + b_6 Doctor + b_7 Age + b_8 Age Squared + b_9 Male + b_{10} Married + b_{11} COD + b_{12} Prohibition dual practice Mid + b_{13} Prohibition dual practice Low + e

Group B Model 3

Ln (Total HH Expenditure) = a + b_1 HHsize + b_2 Secondary NS + b_3 Primary MW + b_4 Secondary MW + b_5 Assis. Doctors + b_6 Doctor + b_7 Age + b_8 Age Squared + b_9 Male + b_{10} Married + b_{11} Measang + b_{12} Peareng + b_{13} Preah Sdach + b_{14} Kirivong + e

Where a is a constant, $b_{1..}$ b_t are coefficient for 1^{st} to t^{th} independent variables and e is error term.

Prior to estimations, though the independent variables were selected based on theoretical hypothesis, univariate regressions of each dependent variables using each independent variable were peformed in oder to confirm the selection of independent variables were acceptable to the model regressions. By the univariate regression, R-square for the independent variables and other statistics including p-value for the model were tested. As noted in Table 4.8, the independent variables consisted of scale variables and sets of dummy variables for categorical or ordinal variables. Each set of dummy variables were used as regressors in the test regressions except the referene variables.

The cut-off point for the independent variable was p-value below 0.2 (National Bureau of Statistics, Tanzania and Oxford Policy Management Ltd, UK. 2001) for the model. Variables which resulted in the model p-value above 0.2 were excluded.

After the regressions were performed, the following points were checked concerning the diagnostic of the estimations. It is noted that types of diagnostics applied vary in studies due to the different levels of statistical analytical requirements in each study and also due to different checking points that statistical software, e. g., SPSS, can or cannot produce (Filed 2005; UCLA 2009). Selection of the tests needs to rely on “the benefit” derived from them in

presenting the model's important problem which can be mitigated or solved, not on the availability alone. "(N)ot all features" tested "are equally important to perspectives of research consumers" (Mullahy 2009. P.8).

This study employed conventional tests (Howell 2007; Filed 2005), though not in an exhaustive way, based on the non-time series data and objective of regressions of this study which was not the best prediction model identifications through selections of variables. This study decided cut-off points based on commonly recommended value (Howell 2007; Filed 2005; University Leeds 2009).

Cook's Distance

The household income and expenditure data of this study inevitably contained outliers (Amemiya 1985; Fagiolo et al. 2007; Mullahy 2009) and the transformation to natural logarithm mitigated this issue. Cook's D (Distance) measures the 'influence' of outliers on resultant features of equations and a combination of 1) "distance" which identifies outlier of dependent variables and 2) "leverage" which identifies outliers of independent variables (Howell 2007). In other words, Cook's D is "a function of the sum of the squared changes in b_j" that would occur if the $_i$th observation were removed from the data and the analysis rerun" (Howell 2007, P. 517). A case which has a Cook's D of more than 0.5 is an outlier and inappropriate for inclusion in the regression analysis (Howell, 2007).

One way of excluding outliers identified by the Cook's test is trimming them. Given the limited total number of cases of this study (N=250) and needs for regressions on separated cases from the total, smaller number of cases in the separated regressions, trimming was carefully considered. In consideration of the nature of the data, the transformation, and negative influence of reductions of the number of cases by trimming, the outliers in some models were trimmed but those in other models were left in the models.

Tolerance

Tolerance of independent variables indicates collinearity among them by showing contribution to the variance of independent variable in percentage which is not made from the other independent variables. An excessively low value of tolerance is regarded as indicating collinearity. In order to check the tolerance, variance inflation factor: the VIF in SPSS was used by the study. The VIF in SPSS analyses is 1 / tolerance. Cut-off points of a VIF vary in studies (Field 2005), for example, a VIF of higher than 10 is regarded as

indicating collinearity (UCLA 2009). This study employed a conservative value of VIF of 5 (Ensor et al. 2009).

(6) Mini-survey regarding allocation of the payments at subcontractor level

A survey was conducted in order to better understand the payment mechanism of performance-based payments through investigating the allocation mechanism of payments to individual health workers at the subcontractor (Health Centres) level. The allocation was made from the payments paid to the subcontractors by the NGO Contractors. The researcher became aware of the allocation during the process of conducting the household survey. Information obtained from the investigation was expected to contribute supplementary information to the process of articulating the incentive environment, with the key informant interview functioning as the main tool of this investigation. The sub-contractor level allocation mechanism including the methods was likely to influence the impact of performance-based payments. Allocation mechanism of sharing user-fee income were also investigated, since the sharing of user-fee income was closely associated with the contracting settings.

This investigation intended to find factors involved in the allocation and the weight given to each of these factors in deciding the allocation, as its main interest. It also investigated rules, monitoring and punishments related to dual practice, since these were likely to shape the incentive environment. Reasons for applying the factors and allocation methods were also investigated.

A questionnaire survey was selected as the best method for this investigation, as this method best reflected the objective of the investigation (to obtain information in a fixed concrete scope), accommodated language issues (the subcontractors' language being Khmer), and because of the supplemental nature of the investigation. A questionnaire survey is a relatively simple method of comparing interviews and accommodates data which are likely to be analysed by more standardised methods (Phellas et al. 2004 in Seale 2004). Due to its anonymity, it also accommodates addressing sensitive issues (WHO 2001) such as income allocation. The questionnaire (Appendix 9) had options for replying, in order to increase the ease for administering it. An investigator asked the questions in face-to-face interviews through an interpreter who posed the questions in the Khmer language. Interviews were conducted in a confidential environment.

The survey was conducted with 9 subcontractor managers at three subcontractor Health Centres from each COD. They were strategically selected according to their level of performance in relation to performance targets in subcontracting: low, middle and high (one for each from one CODs) and identified by the manager of the NGO Contractor who knew the level of performance of the Health Centres. The survey was conducted at he Health Centres and at the Operational District Office in the event that some subcontractors' facilities were difficult to access due to bad road conditions.

Increasing the number of cases surveyed was difficult due to the physical access problems. Access was becoming increasingly difficult due to the rainy season which occurred during the time of the survey. It was also made difficult due to the limited time and financial resources available to this survey. The limited number of respondents also meant that a cautious approach was required when trying to extend the results of this survey to all sub-contractors.

4.4 Study site

(1) Operational Districts contracted out

Exploring the impact of performance-based payments in rural settings is significant, because it is in the rural areas of Cambodia that most of the population lives, often in deprived situations, and where the problems of heath sector development are serious (MOH 1997, 2002; Jacobs and Price 2006). Because of this, this study first selected provinces: Prey Veng and Takeo Provinces (bottom of the map, Figure 4.2), from the 7 provinces where health districts were contracted out (Table 3.4 in Chapter 3. Figure 4.2 showed the non-selected 5 provinces with arrows). From these two provinces, three districts contracted out which had similar socio-economic status and health status (Table 4.10) were selected, two from Prey Veng and one from Takeo Province

These two provinces were rural areas but had higher accessibility from the capital than the other five provinces. The accessibility concerned the distance of 250 Kilometres from the capital, road networks, transportation both from the outside and within the province, resources necessary for transportation, and security issues. Prey Veng Province, which is located on the other side of the Mekong River to Phnom Penh, is known as a relatively poor rural area where most of the people conduct a subsistence level of rice cultivation. Cars sometimes have to drive on open country in this province. Rivers in, and surrounding, the province had limited numbers of bridges.

Takeo Province was located in the plain area. The province is an oblong extending from the north (close to Phnom Penh) to the south. The northern part of the province was more developed than the southern part and was experiencing population growth due to its location close to the capital. Two national roads extending from the capital city contributed the province's development. The southern part suffers chronic floods and was understood to share poverty levels similar to Prey Veng Province.

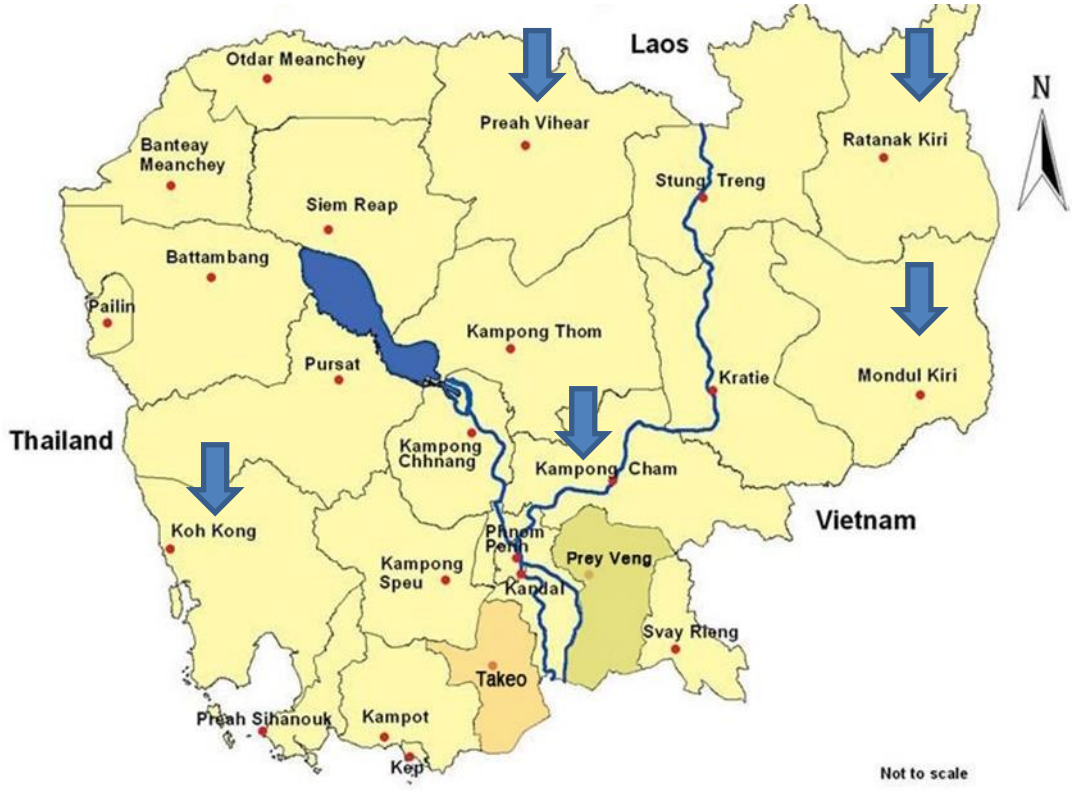


Figure 4.2: Locations of Prey Veng and Takeo Provinces in Cambodia and the other five provinces where Opearational Districts were contracting out (indicated by arrows)
Source: National Institute of Statistics, Ministry of Planning, Cambodia. 2009. The General Population Census of Cambodia, 2008: National Report on Final Census Results. p.vii.

In Prey Veng Province, Peareang District was contracted out to HealthNet International (HNI). The HNI had a contracting relationship with the same district in the ADB Pilot Project. Preah Sdach District was also contracted out to HNI, but it was then sub-contracted to RHAC: the Reproductive Health Association of Cambodia (RHAC). Performance indicators for RHAC were similar to those which HNI was required to achieve in

DFID/World Bank Contracting Project. These two districts were chosen as the subject for the study.

In Takeo Province, Kirivong District, which was contracted out to Swiss Red Cross (SRC) was chosen as a subject for this study. Kirivong Operational Districts had been contracted out to Save the Children France in the ADB Pilot Project. There was another district contracted out in Takeo Province. That was Ang Roker District; however, this district had fewer rural features due to its having the (administrative) district town which was the centre for commerce and transportation.

Table 4.10: Main health indicators of two provinces

	Population	**Infant Mortality Rate per 1,000 live births**	**Under-5 Mortality Rate Per 1,000 live births**	**Vaccinated Children age 12-23 months all kinds* (%)**
Prey Veng	947,357	121	143	68.5
Takeo	843,931	96	102	76.8
Cambodia Rural	N/A	92	111	66.2
	Deliveries assisted by medical staff (%)**		**Health Expenditure per capita Total US$ (Transportation + Health Care)**	
Prey Veng	28.0		16.93 (1.21 + 15.85)	
Takeo	62.1		10.24 (1.95 + 9.70)	
Cambodia Rural	39.4		13.71 (1.17 + 12.76)	

Note: All kinds*: BCG, measles, and three injections of DPT and of polio vaccines (which excludes polio vaccination at birth) (Source 1 p.154). Medical staff**: a doctor, a nurse or a midwife.
Source: Except the population data, all other data were from Source 1. Source 1: National Institute of Public Health, National Institute of Statistics and ORC Macro. 2006. p.37, 120, 125, 144, 154. The percentage of deliveries assisted by medical staff**was calculated from Source 1 p.144. The population data was from Source 2: National Institute of Statistics, Ministry of Planning, Cambodia. 2009: National Report on Final Census Results. p 7

Health status and service delivery in the two provinces were disadvantaged, compared with other rural areas of the country (Table 4.10). Thereby, it was assumed the health status and service delivery were similarly disadvantaged in the three Operational Districts and the DFID/World Bank Project's reason (rural poverty-stricken districts with problems of health service delivery) for selecting the Districts to be contracted out reinforced this assumption. Takeo's better indicators (Table 4.10) were largely attributable to the relatively developed northern part of the Province, but Kirivong Operational District is located in the south.

The following outlines features of the three Operational Districts.

Peareng Operational District

Peareng Operational District is situated approximately 60 Km south east of Phnom Penh. From Phnom Penh, people needed to use a ferry to cross the Mekong River to go there, since no bridge was constructed on the road to the district. This often required extra time for the journey, depending on the number of passengers and cars at ports waiting for a ferry. The less developed road networks in the district cause severe access difficulties during the rainy season; traveling from one part of the district to another may require a detour through a neighbouring Operational District.

Preah Sdach Operational District

Preach Sdach Operational District is situated approximately 100 kilometres to the south-east of Phnom Penh; the south has a border with Vietnam. The total journey to the Operational District from Phnom Penh required more than 2.5 hours, not including the waiting time for ferries crossing over the Mekong River. The waiting-time issue for ferries operation chronically occurred here also. After the river, the limited road network again disrupts access, both to and within the district; this problem intensifies during the rainy season.

Kirivong Operational District

Kirivong Operational District is located at the south end of Takeo Province and borders Vietnam. Access from Phnom Penh to the Operational District was improved in early 2007, when a part of National Road No. 2 was paved, since the Operational District is located relatively close to this road. However, within the Operational District, small rivers, lakes and undeveloped roads pose problems to transportation. Floods in rainy season exacerbate the problems. But in some areas, underdevelopment of roads and bridges requires the use of boats throughout the year.

(2) Operational Districts operated within the MOH system

In order to reasonably explore the impact of the payments associated with the contracting settings, this study identified a control group of Operational Districts. Having a control group was also expected to help clarify and elaborate the impact of payments based on this studies quasi-experimental cross-sectional study design. Definition of the control groups was centred on their Operational Districts' status as those not contracted out and operated within the MOH system (MODs) in the same province where two CODs are located having the same MOH health delivery structure and other similarities as described below. As noted above, statistical data for the economic status for Operational Districts was unavailable since they were not administrative districts.

The strategy for selection of MODs was to select Operational Districts which maximised the similarities between the two groups: CODs and MODs. However, there was limited usable data available for the selection for the quasi-experimental research design; difficulties in randomizing the locations for intervention and control (Harris et.al 2004) were experienced in this study. Particular attention was given to exclude Operational Districts which had apparent differences associated with endogenous factors, such as economic status, causing or having the potential to cause differences in income (Ensor et al. 2009) and expenditure from CODs. Another strategy was to collect information on candidate Operational Districts as the control group from the key informants. The third strategy was to check the result of descriptive statistics analyses of variables in collected data concerning similarity, to see whether the similarity was ensured, given the lack of such statistics prior to data collection. The similarity concerned were the government regular payments????? which were hypothesized to be the same in all five Operational Districts, and the structure of cadres. The data was presented at the beginning of Chapter 6. The fourth strategy was to collect primary data directly from different sources, given the low- or non- availability of secondary data, and process the collected data into usable data for the decision.

Data about the economic status of any Operational Districts in Cambodia was not available; therefore, prior to the data collection, the economic status of CODs and MODs were decided by drawing on approaches to deciding status in the area of development study and practices (Chambers 1997; World Bank 2006). The approaches construct the economic status through proxies. The managers in CODs and some other Key informants were asked for their opinions about whether selection of MODs was reasonable.

1) Criteria for selecting the control group of MODs

The two MODs were to be located in the same province as the two CODs, which was considered to ensure some similarity. In the selection of these two MODs, the following aspects were required and checked, drawing on development studies (Chambers 1983, 1997).

- The socio-economic development levels similar to CODs'.

Existence of industry other than the primary industry, scale of main markets, paved road net-work and traversable road during rainy season, accessibility from big towns outside the Operational District, accessibility of within the Operational District (KI01 March 17 2006; KI03 July 30 2006; World Bank 2006).

- Similarity of geographical access to national roads to the CODs' access.
- The Operational Districts, which have not been "heavily" supported by NGOs or donors. If the support is "heavy", it might be the case that a large proportion of health workers in the Operational Districts are paid supplementary salaries and/or per-diems by the NGOs and/or donors. If such payments were made, this study's comparison between these Operational Districts and CODs could be disturbed.

"Heavily" concerns the scale of resources supported by the NGOs and/or donors such as: project budget; geographical coverage; involvement of the health workers; the high intensity of managerial guidance or direction from the NGOs and/or donors to the running of the Operational District, in terms of closeness, routines, and influence.

"Heavily" supported Operational Districts were excluded based on the following understanding.

The level of support was checked in the database of MEDICAM, the NGO umbrella organisation in the Cambodian health sector. However, the information in the database was insufficient to judge the level. In Cambodia, information about NGOs seemed rarely to be available other than in the MEDICAM database. Subsequently, the investigator obtained additional information directly from the NGOs.

2) Selected control Operational Districts (MODs)

In Prey Veng Province where two CODs (Peareang and Preah Sdach Operational Districts) are situated, two Operational Districts - Kamchey Mea and Meseng Operational Districts - were selected as the control Operational Districts.

As a result, two CODs and two MODs in Prey Veng province were the subjects for this study (Figure 4.4[4]). The similar features of the three CODs and two MODs, and the factors used in selecting them, are outlined in Table 4.11.

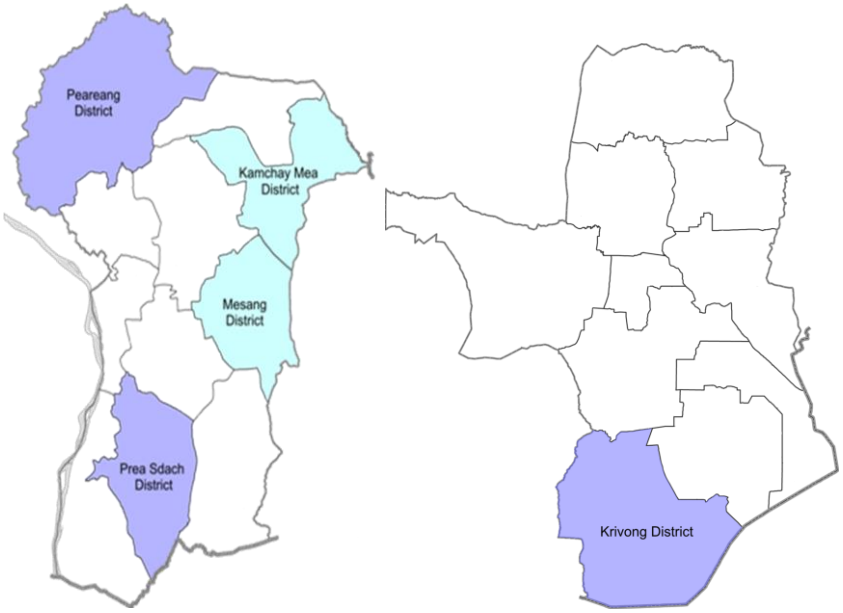
The two MODs were from five Operational Districts in the province which were not contracted out (details of the screening are given in Appendix 10). Kamchay Mea Operational District is situated at the western end of the province. Undeveloped roads in and out to the Operational District were severely affected by rain, posing access problems. Similarly to the three CODs, this Operational District did not have a noticeable industry, other than a near subsistence-level of rice cultivation; the area was deprived. It had been a control Operational District in ADB Pilot Project evaluation (ADB 2004). This suggested that our selection of this Operational District was reasonable since the evaluation potentially found its characteristics worth being used as the control (ADB 2004).

Mesang Operational District is situated in the south of Kamchay Mea Operational District. It had similar access problems to those in Kamchay Mea. It was assessed as particularly poor even within Prey Veng Province and as a difficult place for Cambodian NGOs to conduct projects due to security issues (KI16 March 28 2007).

ii. Takeo Province

In Takeo Province, there are three Operational Districts which were not contracted out and two Operational Districts which were contracted out (Kirivong and Ang Roker Districts). Screening excluded all the three Operational Districts , because their development level and access to the national roads were better than Kirivong, suggesting they were likely to have a higher economic status. As a result, no control Operational Districts were selected (Appendix 10).

[4] A map showing health Operational District was not available.



Figrure 4.3: Location of five Districts*
Note:District*: administrative districts. Maps for (health) Operational Dstrcits were unavailable.

Table 4.11 Outline of features of Districts subjects for this study

	CODs			MODs	
Districts	Kirivong	Peareang	Preah Sdach	Kamchey Mear	Mesang
Province	Takeo	Prey Veng	Prey Veng	Prey Veng	Prey Veng
Population	196,380	115,217	201,870	126,045	123,289
HC*	15	9	20	10	11
Main industry	agriculture	agriculture	agriculture	agriculture	agriculture
Road network development level (pavement, ranks of road, access,etc.)	A little better around Operational District office due to its closeness to a paved national roads. Obstructed by lakes and floods which require uses of boats in the areas through the year.	Low. Severe affects by raining season which access from Operational District office to health centres impossible. Need to detour through another Operational District to visit a group of Health Center.	Low. Need to go through fields. Severe affects by raining season which access from Operational District office to health centres impossible.	Low. severe affect by raining season which access from Operational District office to health centres impossible.	Low. severe affect by raining season which access from Operational District office to health centres impossible.
Markets	Not having a big market. Not an very mportant traffic point.	Not having big markets. Not an important traffic point.	Not having a big market and Not an important traffic point.	Not having a big market. Not an important traffic point.	Not having a big market. Not an important traffic point.
Support for health development	NA	NA	NA	'not heavily'(Appendix 10)	'not heavily' '(Appendix 10)
Other feature	NGO contractor: Swiss Red Cross	NGO contractor: HealthNet International	Quoted as very poor area (KI01 Apr. 23, 2005) NGO contractor: RHAC**		Quoted as very poor area (KI17 April 25 2007)

RHAC** Reproductive Health Association of Cambodia

Source: Peareang: Noirrhomme et al. 2007; Preah Sdach: Preah Sdach District, 2006; Kirivong; National Institute Statistic 1999, cited in Jacobs et al. 2010; Mesang: Mesang District, 2007; Kamchey Mea: Kamchey Mea District, 2007; KI01 Apr. 23, 2005; KI17 April 25 2007.
NGO

4.5 Validity of the quantitative investigation in this study

As described above, due to the quasi-experimental design of this study, the internal validity of this study concerning the quantitative study part is incomplete. However, aspects of validity are still fulfilled, while scientific tests or experimental research projects examine different aspects of the validity or projects depending on their disciplines or methodologies. The validity concerning the accuracy of the expenditure and income household surveys was increased by the strategies described above. Statistical conclusion validity refers to whether or not statistical inference of covariance between variables is justified (Onwuegbuzie and Johnson, 2006). This study secured the statistical conclusion validity by: a sufficient sample size for statistical methods; checking the accuracy of fit of regression models, heteroskedasticity and the VIF (Howell 2007; Filed 2005; Dumont et al. 2008; UCLA 2009; Ensor et al. 2009), where different studies employ different tests, even sometimes depending available test methods by the statistical software applied.

Internal validity addresses whether or not an observed covariation should be considered a causal relationship which is influenced by the quality of study design (Bryman 2004; Salkind 2004). The internal validity was ensured by the arrangement which removes discerned 'threats' to the validity (Onwugebuzie and Jonson 2006) of this study. These threats were concerning "history," "maturation," "selection," "testing," "instrument," "regression" (not in the statistics) and "mortality." "History" concerns an external event that occurs simultaneously which may affect the experiment (the research setting). "Maturation" concerns the changes caused by physical and psychological forces. "Selection" concerns the selection bias of participants in the experiment. "Testing" concerns the influence of a pre-test on the later performance of the subject of a study. "Instrument" concerns the accuracy of the measuring instrument of the test. "Regression" concerns the propensity of extreme scores which will regress to the mean. "Mortality" concerns the dropping out of participants before completion of the experiment (Salkind 2004). These threats would have hardly affected this study, because (1) quantitative methods of this study were conducted in the relatively short term but the elaborated questionnaire reflected at the maximum level of the changes in incomes or expenditures of the health workers that might have concomitantly occurred; (2) physical and biological forces that affected the health workers and their environment were

not reported; (3) the complete enumeration survey rendered the household survey free from the selection threat; the sample selections of the survey for sub-contractor-level payment allocation drew on knowledge of the NGO Contractor managers and this approach reduced the selection bias (4) the pre-test was not conducted in the same areas where the actual survey was conducted; (5) physical measurement instruments were not used; (6) selections of the health workers surveyed were not based on their extreme scores in an ordinal variable concerning their features.

External validity examines whether or not an observed causal relationship should be generalized across different measures, persons, settings, and times (Calder et al. 1982 cited in Linch 1983). External validity faces the following three threats: "multiple treatment inference," "reactive arrangements," and "pre-test sensitization." "Multiple treatment inference" concerns an unintended treatment the participants receive which may hinder the generalization of the results of the experiment. "Reactive arrangement" concerns changes in behaviours of the participants due to their awareness of the experiment. "Pre-test sensitization" concerns the influence of a pre-test on the treatment of the experiment (Salkind, 2004). None of the three threats had any relevance to this study. The pre-test of this study was conducted outside the study site. The reactive arrangements threat was eliminated by (1) the elaborate questions of questionnaires; (2) informing participants of the purpose of this study as a scientific study; and (3) protecting the confidentiality and the anonymity of the participants.

Validity concerning qualitative studies is "interpreted as the extent to which an instance accurately represents the social phenomena to which it refers" (Hammersley 1990: 57). In addition, concerning qualitative studies, reliability of the findings is important. The reliability "concerning qualitative studies refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions" (Hammersley 1992, p. 67). This study's strategic selection of the key informants ensured these aspects of validity as explicated above.

4.6 Ethical Consideration

This study obtained official permission for its fieldwork from the ethics committee of the Cambodian Ministry of Health (Appendix 13). In addition, the Ethics Committee of Queen Margaret University reaffirmed the earlier approval of the Ethics Committee of the London School of Hygiene & Tropical Medicine (LSHTM), given prior to the transfer of the investigator from LSHTM to Queen Margaret University.

Data collection did not include biomedical and in-vivo experiments. Also, no children participated in the research study, which would have required parental consent, nor did any vulnerable persons, who might have been affected by their participation.

Informed consent, confidentiality and anonymity of respondents in the data collection were assured in the course of this study. However, the names of key informants are retained only on a list in consideration to cultural sensitivity. Informed consent from the respondents and key informants assured, prior to their decisions to participate. The purpose, the content, tand the option of non-participation, were all explained to them both verbally and in writing, in the Khmer or English language. Measures in place to ensure confidentiality and anonymity were explained. Upon their consent, they signed consent forms.

The surveyors, the people who implemented the data entry, and the interpreter, were all trained to respect the confidentiality and anonymity of the respondents. The data was securely stored, with only the investigator able to access it. Data from the cadres, in which the number of respondents was limited, has remained undisclosed.

Chapter 5 Implementation of the DFID/World Bank Project in Peareang, Preah Sdach, and Kirivong Districts

This chapter presents findings responding to Research Question 1. The research question is: what are the differences in incomes and expenditures of health workers' households between the two types of districts: one contracted out and another managed by the ministry of health? This chapter illustrates the payment mechanism of performance-based payments and other payments associated with the contracting out, implementation methods of DFID/World Bank Contracting Project and the incentive environment surrounding the payments. These findings concern the three contracted out districts: CODs (Peareang and Preah Sdach Districts in Prey Veng Province and Kirivong District in Takeo Province). The findings were derived from the key informant interviews, except the one relating to the payment mechanism at the health facility level.

It was hypothesized that the payment mechanism, operation of the mechanism, other aspects of implementation and arrangements of the contracting projects have been influencing the incentive environment. The characteristics of the government health sectors and health workers' private practice income were also likely to have influence.

It is important to note that these payment mechanisms and implementation methods were uniquely set by each of the NGO contractors. Some sections of this chapter provide uneven descriptions of the three districts, resulting from the imbalance of information available. The imbalance seems to pertain to the fact that there was no requirement for the contractors to document the implementation in the project.

5.1 Basic information of three districts

(1) Issues of physical settings

Difficulties in transport due to the underdevelopment of roads and bridges are described in Chapter 4. These difficulties were a burden on the population in terms of accessing health services within the three districts (e.g. as represented by photos in Figure 5.1 and 5.2 below), affecting health service delivery and the working environment at the health facilities through:

- Disturbing patients' service access
- Encouraging some patients to visit health facilities outside the area where they lived in order to access health services more easily

- Bad communications and delivery of materials between the (health) Operational District Offices and the Provincial Health Department or MOH, or between the Offices and health facilities within the district.

Figure 5.1: Photograph of a road after rain in Peareang District

Figure 5.2: Photograph of a ferry in Peareang District

(2) Economic status

The three Operational Districts were selected on the basis of their socio-economic similarity (Chapter 4. 4), given the limited availability of economic information (Health Operational Districts were not subjects for government economic study) and the basic notion about features of these Operational Districts by the DFID/World Bank Project which selected them as its project site (Chapter 3.6.1). In DFID/World Bank Contracting Project, the selection was based on their feature as poor, rural and remote Operational Districts with low health status (MOH 2007b). However, in exploring the impact of the contracting performance-based payments on the income of health workers and their households, it is important to test whether the impact of payments exceeded that of the impact of the economic status of the Districts. This is because the impact of the two factors may compete in terms of increases in incomes of heath workers as the economic status may influence income from dual practice (Ensor et al. 2009).

Given the lack of economic data for health Operational District, this study estimated the economic status from available data of distribution of poverty rates at the level of communes, through estimating the economic status of administrative districts. A commune is an administrative unit under a district in the Cambodian administrative structure. The poverty rate is a measure of poverty widely used and shows the rate of people living below the poverty line (MOP and WFP 2003). Detailed information of communes having their own poverty rate was unavailable.

Peareang and Preah Sdach Districts (Figure 5.3) appeared to have a similar economic status; patterns of the poverty rate distribution appeared to be similar except for the fact that Peareang District has the highest range of the rate, greater than 75% in one area. Kirivong District (Figure 5.4) appears to have a lower poverty rate than the two districts and Kamchay Mea and Mesang Distrigts (Figure 5.3). This estimation of the slightly higher economic status of Krivong District was supported by a long-term observation of the three districts by one MOH staff member responsible for monitoring the two consecutive contracting projects (KI 13 August 8, 2006).

In Figure 5.3, Peareang and Preah Sdach Districts appeared to have a similar economic status to that of of Kamchay Mea and Mesang Districts. As a result, these four Districts appeared to have a slightly lower economic status than Kirivong Districts (Figure 5.3, 5.4).

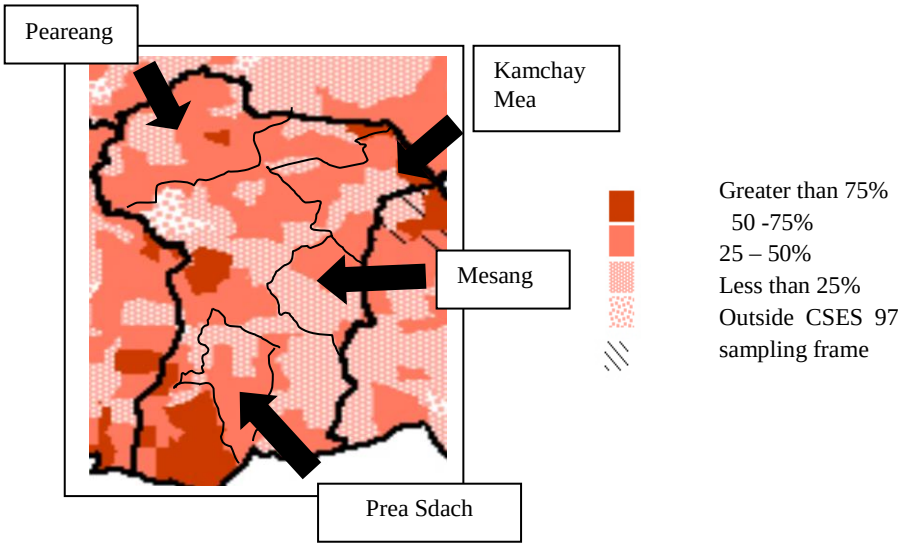


Figure 5.3 Poverty rates distributions at commune level in Peareang, Prea Sdach, Kamchay Mea and Mesang Districts in Prey Veng Province
Source: MOP and WFP, 2003, P.53.
Borders of the Districtss were added

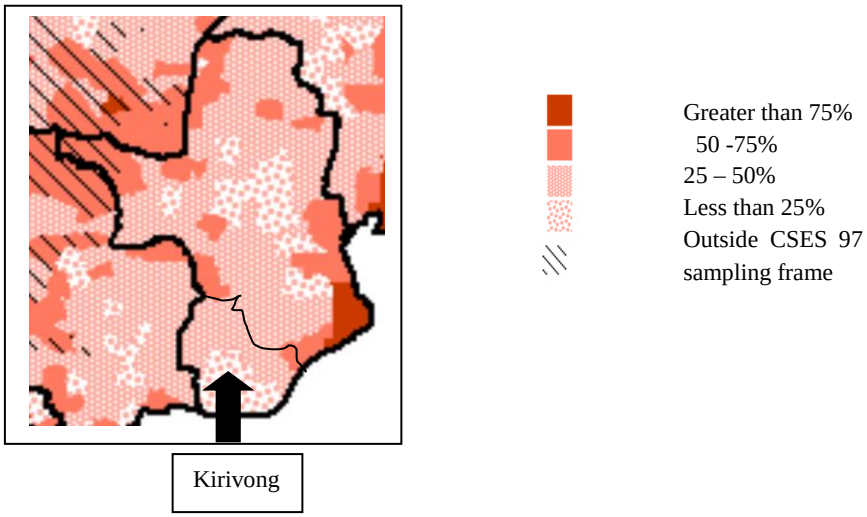


Figure 5.4: Poverty rates distributions at commune level in Kirivong District in Takeo Province
Source: MOP and WFP, 2003
P.53. Borders of the district were added

(3) Health facilitiess,the equity fund, NGO staff

It was confirmed that all three Operational Districts had the same health system structure as a rural health district. The setting of Equity Fund differed; however, the difference seemed to have little affect on the research setting of this study (Table 5.1).

Table 5.1: Basic features of contracting arrangements of the three Operational Districts

District (contractor)	Peareang (HNI)	Preah Sdach (RHAC)	Kirivong (SRC)
Number of Health Centres and Referral Hospitals	- 15 Health Centres (including a former District Hospital) - 1 Referral Hospital	- 9 Health Centres - 1 Referral Hospital	- 20 Health Centres - 1 Referral Hospital
Equity Fund	- had existed, was used-up in 2006	- held at the referral hospital	- held at pagodas in the community for services of the HCs and the Referral Hospital.

Source: KI02, Feburary 27 2006; K01, March 17 2006, June 19 2007; KI04, April 22, 2005.

HNI had one international (manager) and 14 national staff and RHAC had only national staff (one manger and 6 staff). The information for SRC was unavailable. A shortage of health workers was commented as an issue in Preach Sdach and Kirivong Operational Districts; the number of midwives and secondary-level health workers were low in the former and the number of different cadres in the later (KI02, Feburary 27, 2006; K01, March 17 2006; KI03, July 30 2006).

(4) Subcontracting

The NGO Contractors subcontracted operations of health facilities to health workers of the facilities. The arrangement of subcontracting was almost the same among the CODs (Table 5.2). Subcontractors (often the facility head) seemed to have a high level of management responsibility for their health facilities. Only SRC established a subcontracting relationship with the Operational District Office at the time of the fieldwork of this study, but HNI and RHAC perceive that the capacity of the Office was inadequate. Instead, they established

contract relations with individual staff members of the Office (KI02, Feburary 27 2006; K01, March 17 2006; KI03, July 30 2006).

Subcontractors, in order to achieve the subcontract targets, were required to operate the facility by managing resources such as health workers, finance, and materials, by making action plans and budget plans, and by monitoring health worker performance.

Table 5.2 Outline of subcontracting structure and monitoring in three Operational Districts

District (contractor)	Peareang (HNI)	Preah Sdach (RHAC)	Kirivong (SRC)
Subcontracting structures	- HNI and the Health Centres - HNI and the Referral Hospital (no subcontract with OD* Office)	- RHAC and the Health Centres - RHAC and the Referral Hospital (no subcontract with OD Office)	- SRC and selected Health Centres - SRC and the Referral Hospital - SRC and the district Office -The OD Office and selected Health Centres
Monitoring (number of the team)	- 3 joint monitoring teams - HNI monitoring team on administrative aspect	- A team of OD Office staff - RHAC monitoring team	- A joint monitoring team to which staff of OD Office joined

Note: OD* Operational District

Source: (KI02, Feburary 27 2006; K01, March 17 2006; June 19; 2007; KI03, July 30 2006)

One term of all subcontracting lasted three months. After each term, reviews of performance achievements and of contraventions of the contract were held. If targets were achieved with no contraventions, the contract was automatically renewed.

The employment arrangement of health workers were the same in CODs, having a two-tiered contractual structure; first, with the subcontractor (the health facility they were working for), and second, with the contractor NGOs. The health workers were seconded to the contractor NGOs, and in which these NGOs had the option of not-making a contractual relation with specific health workers.

The sub-contracting arrangement appeared to intensify some of the meritocratic features of the contracting project: for example, HNI which took a "hands-off" approach (KI01 March 17 2006) allowed the sub-contractors to hire health workers from outside, including those who were not government workers, and to opt to not hire government workers who, though they belonged to the health facility, were judged to be less capable of contributing to achieving performance targets. Those government workers were able to maintain their employment relationship with the MOH. In all CODs, the subcontractors could choose the best person for achieving the targets as the manager, as a result some managers were not the Health Centre Chief (KI01 March 17 2006; KI02 July 24 2006; KI04 March 17 2006). HNI replaced some of subcontractor managers with other health workers because they were not regarded as competent (KI01 March 17 2006). These arrangements appeared to be more meritocratic than in the government sector.

Some NGO contractors formed joint monitoring teams, consisting of their own staff and health workers, and often including the staff of the Operational District Office. Some NGO project managers monitored and decided the final results themselves (KI02 July 24 2006; KI13 August 8 2006). These seemed to have an intensified form of monitoring which aimed to improve the health workers' performance as well as preventing or decreasing dual practice (Di Tella and Savadoff 2001). Alongside these forms of monitoring, MOH also conducted quarterly monitoring on the contractor NGOs' performance.

(5) Special rules for dual practice

The NGO Contractors imposed punishments on misdeeds, including dual practice, by subcontractors and individual health workers. Therefore, it was expected that the dual practice was reduced. However, the effect has been little reviewed. HNI and SRC imposed

financial punishments which included reducing and stopping payments to the health workers. The HNI penalties were imposed over the incidents including money fraud of a subcontractor, over-charging patients, false reporting and prescribing drugs irrationally (KI01, June 19 2007). SRC punished breaches of their internal rules and the punishments included cancelling of contracts (KI04, May 19 2007). The MOH rules had formal warning procedures in which the third warnings against misconducts theoretically leads to dismissals; however, dismissals were rarely carried out because of resistance from the provincial health office level (KI01, August 22 2007; KI04, May 19 2007).

These penalties and punishments seemed to be changes in the institutional settings (Mathauer and Carrin 2010). They may be viewed by health workers as changes in job security. The subcontractor level, conducting misdeed seemed seledom affect payment allocations to individual health workers, the minisurvry found (more details in 5.2.6).

5.2 Performance-based payments

The mechanism of the performance-based payment in CODs were almost similar to each other (Table 5.3)

Table 5.3 Income composition of health workers by the contractor NGOs definition

Peareang (HNI)	Preah Sdach (RHAC)	Kirivong (SRC)
1) Government regular payments	1) Government regular payments	1) Government regular payments
2) Performance-based payments	2) Performance-based payments	2) Performance-based payments
3) Share from User-fee income	3) Share from User-fee income	3) Share from User-fee income
5) Others*	4) Seasonal (quarterly) payment (not connected to performance)	5) Reimbursements from the equity fund
	5) Others*	5) Capitation payments for occurrences of new purchases of social health insurance
		6) Bonuses** (occasionally)

Note: 5) Others*: supplementary salaries and per-diem paid by external organisations. 6) Bonuses**: were paid every 6 months to the best performing five subcontractors among all the health facilities and the Operational District Office (KI03, Kirivong District. May 19 2007).
Source: KI01 March 19 2007; KI02 May 2 2007; KI04 May 19 2006.

The main income components were similar among the three districts, except that incentive payments (capitation payments) in Kirivong Operational District paid for increasing the purchase of social insurance by patients (Table 5.3 Point 3). In the three districts, shares of user-fee income were paid according to a national allocation policy and other arrangements which are explained below. Point 4) in Preah Sdach and 6) in Kirivong Operational Districts were not main components (Table 5.3) (KI01 March 17 2006; KI02 July 24 2006; KI04

March 17 2006).

(1) Payment mechanism

The performance-based payments in the three Operational Districts took a similar form to the fee-for-services in which payment are retrospectively made based on the number of services provided. They set an amount of payment for one case of a type of health service to which subcontracting performance indicators were attached: e.g. 1000 riels for one case of antenatal care. The three Contractor NGOs set their own fee schedules. However, the subcontractors were not necessary paid according to the number of cases provided, since the NGO Contractors reflected other aspects of performance in their payment decision.

Generally performance-based payments expose employees to risks of fluctuations of the payments; however, HNI and SRC restrained the fluctuations since they included in the payments to the subcontractors (health factilities) the proportion which reflected the past total payments. The proportion ensured that the health workers received payments which reached at least a certain level of the previous payment.

Separatly from the subontrator level arrangement, the NGO contractors had a kind of guidelines for monthly total payments, in order to finally ensure a sufficient level of payment to the individual worker for their living and to avoid unfair differences in payments among them (KI01, April 23, 2005; KI02, July 24, 2007). Details of this were presented in 5.2.(3).

HNI, with their hands-off approach, largely delegated decisions about payments and allocations at the individual-health-worker level to the subcontractors (KI01, April 23 2007), though specifics about the degree of delegation seemed difficult to define.

(2) Indicators

These indicators for performance-based payments were all quantitative, except in Kirivong district (Table 5.4), and nearly the same as the items stipulated in the primary contract agreement between MOH and the NGO Contractors apart from a few exclusions (e.g. breast feeding) and additions (e.g., staff appraisal, monitoring of Health Centres by Operational District Office). Because of this emphasis on the volume of output of service delivery, an increase in service delivery seemed reasonable to expect (Eichler et al. 2007). However, the qualitative aspects also were actually monitored and reflected in the payments in Peareang and Preach Sdach Operational District.

Targets of the indicators were decided based on the size of the population in the catchment area of the subcontractor. In Kirivong Operational District conditions surrounding Health Centres were also reflected in the indicators; for example, lenient indicators were applied to some remote Health Centres (KI10, July 12 2007). SRC changed the indicators for all subcontractors in the course of the project implementation in order to more accurately reflect the subcontractors' capacity and to further improve health service delivery. For example, an indicator for deliveries attended by health workers which was previously without specification of the location of the delivery now became with the specification (Health Centres).

Table 5.4 Examples of performance indicators for subcontractor-Health Centres in three Operational Districts

Peareang (HNI)	Preah Sdach (RHAC)	Kirivong (SRC)
- Outpatients - Deliveries at health facilities - Deliveries at home - Users of birth spacing (oral and injectable contraceptives) - Children who were provided with Vitamin A - Short admission - Minor surgery - Safe dilation and curettage - Full immunization - Antenatal care - Vitamin A provision	- Outpatients - Deliveries at health facilities attended by trained staff - Deliveries at home by trained HC staff - Users of birth spacing - Oral and injectable contraceptives - Children who were provided with Vitamin A	(Indicators were changed both regarding values and content in the course of implementation) - Outpatients - Deliveries at HC - Antenatal care (more than 2 times during the pregnancy) - Birth spacing - full immunisation of children *Whether the following was done or not* - Staff appraisal

Note: ( ) Contractor

Source : MOH 2007b; RHAC Preach Sdach Project 2007a.b.; SRC Kirivong Project 2007.

Note: Target of these indicators differed at each Health Centre. Some indicators were altered in the course of implementation.

(3) Guidelines for allocation of the payments among health workers

As stated above, NGO Contractors set guidelines for payments to the health workers in order to ensure fair payments. This study assumed that the information asymmetry (Milgrom and Roberts 1992) between the NGO contractors and the health workers influenced effects of the application of guidelines. It assumed also that multiple-layers of principle-agent relations (Besley and Ghatak 2003) and distortions by organisation (Mathauer and Carrin 2010) might have had an influence. In order to protect confidentiality and privacy, the guideline payments to the cadres, to which a limited number of health workers belonged or were assigned to, were not shown in a specific district.

HNI in Peareang District

HNI had guidelines on maximum total monthly payments: for example, US$200.00 for nurses. The guideline was set based on health worker's 1) cadre, 2) responsibilities in the MOH health system such as Health Centre Chief, Chief for EPI and 3) positions in the subcontracting, such as manager.

Payments to subcontractors were first calculated based on the quantity of services provided and the fees, then adjusted by results of monitoring of other aspects. From the adjusted amount, financial penalties were extracted if mismanagement such as false reporting of the achievement was found. Then, the payments were made to the subcontractors. At the subcontractor level, the payments were allocated among health workers alongside the user-fee income. However, before the allocation, 2% the user-fee income was deducted from the total for remittance to the national treasury and PHD, with a part of this (the ratio/amount was decided by the subcontractor) being kept at the facility as a budget item relating to operational costs.

In order to ensure the payment level to individual health worker, HNI obtained information and receipts of the received income of the individuals (KI05, March 17 2007).

RHAC in Preah Sdach District

RHAC reflected in the performance-based payments, not only the output of health services but also three other factors. Of the performance-based payments, 55% reflected a) the outputs and b) the monitoring result, 15% reflected c) the punctuality, and 30% d) other performance. RHAC also set guidelines for maximum payments which reflected the same two factors as HNI did: 1) cadre and 2) responsibility within the MOH health system (KI02, May 2, July 9 2007) (Table 5.5).

Table 5.5: Reference payments in contracting out in Preah Sdach (monthly, US$)

Primary Nurse	Secondary Nurse	Primary Midwife	Secondary Midwife
80.0	100.0	80.0	100.0

.

Source: KI02, July 9 2007.

RHAC had guiding formulas for the allocation of user-fee income within a health facility for the same purpose as with the performance-based payments (KI02 July 9 2007).

SRC in Kirivong District

SRC took a more interventionist approach to payments to individual health workers, than HNI and RHAC, particularly in comparison with HNI. SRC ultimately decided the payments to individual health workers. It calculated allocations to the individuals from the total payment to a subcontractor based on three factors relating to the individuals 1) cadre, 2) the responsibility within the MOH health system, and 3) type of facility (Health Centre, the District Office or the Referral Hospital), in reference to SRC's allocation schedule to individuals. The monthly average of the total payment among the health workers was reported to be around US$100.00, not including government salaries and the occasional bonuses (Table 5.3) which were different from the performance-based payments, but including the incentive to increase participation in community social insurance (SRC 2006).

(4) User-fee income allocation

The three contractor NGOs differed in their policy about the allocation of user-fee income for payments to the health worker. This consisted of differences in:

1) level of adherence to the national policy of user-fee allocation (or, instead, the level of adherence to the special allocation rate for the DFID/World Bank Contracting Project: the 98% available for payments to health workers), and 2) portion to be sent to the Operational District Office after the remittance to the national treasury and the remittance to the Provincial Health Department. HNI theoretically made 98% of user-fee income available for payments to health workers; RHAC mostly followed the national allocation policy; SRC took mixed approaches (Table 5.6).

Table 5.6: User-fee income allocation approach in the three districts

Peareang (HNI)	Preah Sdach (RHAC)	Kirivong (SRC)
98% of the total was allocated to the budget for incentive of the facility staff	- Adhered to the national allocation policy - Upon adherence, 55% of the total was allocated in the budget for the incentive of the facility staff - A remittance of 5% of the total to the OD* Office needed to be made	- Applied different rates based on the health facility type - Changed the rates during the project <u>At health centres:</u> - 93% (later 55%) of the total allocated in the budget for the incentive of health facility staff - A remittance of 5% of the total to the OD Office needed to be made <u>At the hospital:</u> - 90% (later 52%) of the total was allocated in the budget for the incentive of health facility staff - A remittance of 8% of the total to the OD Office needed to be made

Note: ( ): name of NGO Contractor, OD* Operational District.
Source: KI01 March 17 2006; KI02 May 2, 2007; KI04 May 19 2007, SRC 2006

(5) Supplementary salaries

Without control from the contracting setting, i.e., in ordinary settings, degree of the importance to the government health workers of supplementary salaries appeared to be enhanced. The salaries were mostly paid by NGOs and bi- and/or multilateral international cooperation agencies and were often higher than government salaries. Health workers

reacted sensitively to differences in supplementary salaries and per-diems (Personal observation; KI16, July 21, 2007) that they received within the LMIC health sector. Supplementary salaries appeared to be a factor, brought in by the multi-layered and multi-task principal-agent relationship, that was framing the incentive environment.
The differences in supplementary salaries sometimes resulted in resentments among the health workers towards those who obtained the salaries or higher salaries (KI16, July 21 2007), as they also sought the higher salaries.

Allocating supplementary salaries and per-diems seemed to function as a venue for exercising the patronage system in Cambodia (Tan 2008) that exists between the manager of Operational District and the health workers. The Operational District Chiefs' allocation of opportunities to receive supplementary salaries and per-diems among health workers, i.e., opportunities for participation in projects and training courses, seemed to be entangled with and distorted by the patronage between the two parties. Patronage indirectly affects health workers' total income. Such Chiefs were respected health workers in the Operational District as those who could invite projects to the Operational District for which the health workers could receive supplementary salaries and per-diems (KI11, August 14, 2006).

This allocations seemed to be connected with the institutional arrangements (Mathawer and Carrin 2010) surrounding the public sector incentive environment (Besley and Ghatak 2003). Also, such payments and allocations could have the effect of distorting and reducing the effectiveness of financial incentives paid by the government. They seemed to fragment the health workers' labour supply among tasks and sectors or to increase the supply of labour to the work which resulted in higher payments.

SRC controlled supplementary salaries and per-diems from outside the contracting project. SRC pooled these payments and allocated them to the health workers based on the payment schedule to individual health workers (KI04, April 22 2005), but they could not control supplementary salaries paid by a vertical program in the global scale (Jacobs et al. 2010).

SRC set a ceiling on the share of user-fee income (US$45.00 monthly) to individual health workers in the later part of the implementation, because SRC intended to keep the health workers' total income moderate, avoiding the creation of large problematic disparities between their income during and after the project (because of income decrease after the completion of the project) (SRC 2006; KI10, July 12 2007). However, it was said that this

ceiling affected only workers at District Hospital, not Health Centres, because the income was low at Health Centres (KI10, July 12 2007).

(6) Payment methods to individual health workers at the subcontractor level

The payment guidelines set by NGO Contractors seemed to be blurred in the allocation of payments to individual health workers at the subcontractor level, since the subcontractors held the authority to allocate payments and had their own methods of allocation, and actually paid the health workers. The methods might have influenced the impact of performance-based payments or the incentive environment. Compliance with the guidelines might have been low due to resentment towards meritocratic payments among the health workers and to a particular Cambodian way of monetary transactions (KI15, March 27 2007; KI05, June 19, 2007, SRC 2006). Their allocation methods seemed to be less meritocratic and, as a result, the degree to which payments reflected individual performance was ambiguous. Overall, it seemed that an accurate account of the amount that an individual health worker received was known nearly only to themselves.

Although the methods adopted the same factors as the guidelines contained as below; however, at extreme, they were equal allocations. Securing explicitly a certain level of "equality" by a collective unionized approach indicated their strong preference for less meritocratic payments. This approach was also interpreted as a reflection of resentments felt about others' receiving higher payments, which resulted in implicit and explicit rebellious attitudes towards superiors and damaged teamwork (KI17 August 20, 2006). At some Health Centres, equal allocation was made only after the manager was paid extra amounts ranging from $2.5 to $5.0.

Having the tendency towards equal allocation, the methods still showed limited variations in the combination of factors considered in deciding allocations (Figure 5. 5 and 5.6), with the following added minute variations to the methods.

- Some subcontractors (Health Centres) mixed performance-based payments and income from user-fees and allocated, but others did not.
- The allocation guideline was only applied to sharing income from user-fee.
- Some of the allocation percentage had two decimal points (e.g., 9.05%, 7.75%).

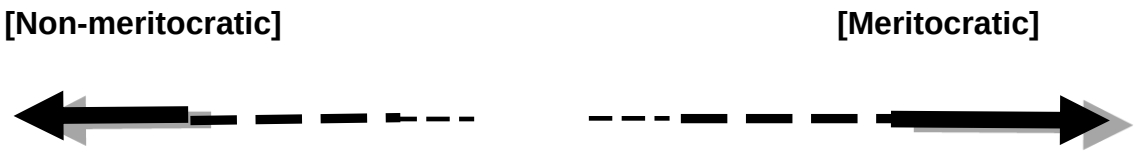


Figure 5.5: Non-meritocrtic or meritocratice intensity of factors used for allocations of the performance-based payments (and user-fee income at some facilities

Proportions of each factor among all factors used for determining allocations were quantified. The quantified proportions were transformed into a radar chart and showed an inclination of the factors towards a less-meritocratic nature (Figure 5.6)

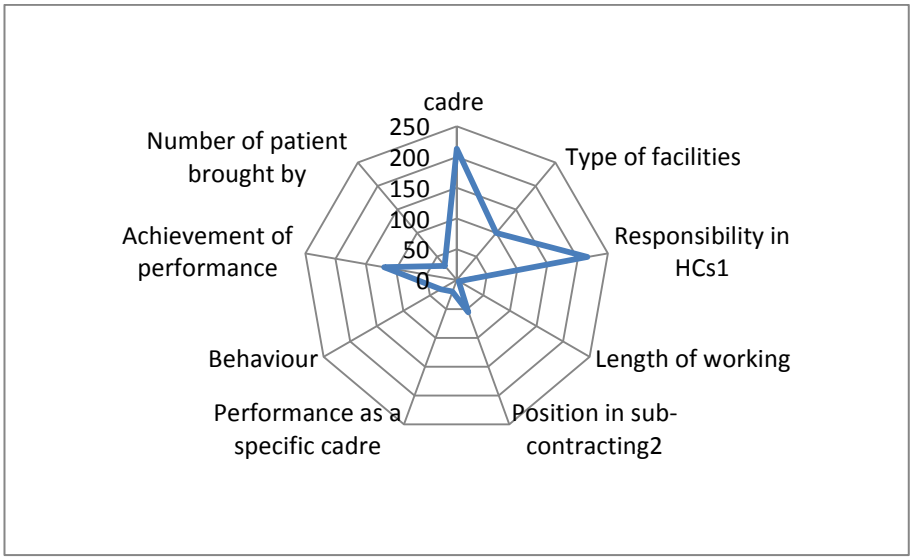


Figure 5.6: Factors used for allocation of performance-based payments and user-fee income at Health Centres (total score: 800)

Note: Responsibility in HCs1: positions in the Health Centre under MOH management system Position in sub-contracting2: positions assigned in the sub-contracting, e.g., the manager of subcontracting. Each respondent was given 100 points and the 100 were divided by factors defined by the respondent according to their level of importance. The maximum point of a factor was 800 points.

5.3 Dual practice

It seems that reducing or eliminating dual practice was less emphasized than increasing health services delivery as the objectives of contracting out and of performance-based payment in the DFID/World Bank Project. In the project, the health workers were simply required to refrain from dual practice. This was confirmed in the explanation made above (Chapter 3) about the clause in the contract document concerning dual practice.

Dual practice seems to be an open secret since it has been ubiquities in Cambodia. Health workers spoke informally about their dual practice (Personal observation, KI15 March 15 2007, KI 14 May 16 2006) and sometimes even that of their family members, who had no medical qualification (Personal observation, the monthly meeting of Peareang District, 2006). Income from the private practice at the beginning of project (2004) was only estimated by key informants (Table 5.7) because of a lack of formal information. It is noted that the estimation was made based on the entire group of health workers in each Operational District, not particularly on those who were the subject of the household survey. Overall, most of cadres conducted dual practice; the primary-level nurses and midwives in Kirivong might have opted out. The higher qualification they had the higher their income was. Compared with the quoted government regular payments (US$10 to 30, Akashi et al. 2004; Soeters and Griffiths 2003), all carders earned significantly higher incomes. However, it is noted that their income from private practice as a secondary job might have fluctuated (Shisko and Rostker 1976), depending on the market (Ensor et al. 2009).

The incomes of cadre in Peareang and Kirivong Districts fell within common ranges. However, the incomes of doctors and assistant doctors in Preach Sdach Operational were in a lower range. These two situations imply differences from the identified levels of economic statuses among the three districts above (the similar level between Preah Sdach and Peareang Districts, but Kirivong had a higher level). However, the lower income range in Preach Sdach appeared ostensibly to suggest the lower economic status (the estimated income range may be far from correct), if the income for one day is calculated from the income range. The calculated income tends to be rather lower compared with the reported average charge for one dual practice case. Their monthly incomes were divided by 25 on the assumption that the health workers did dual practice at least for 25 working days in a month. The calculated one day income of US$12 to US$16 was intuitively thought of as low relative to the average charge for one case: US$2.5 to $10 (Table 5.7). There was the smaller superiority of the incomes of doctors over that of the secondary nurses, compared with the other two districts,

the doctors' income was still ambiguous.

Table 5.7: Estimations about private practice at the beginning of the project (prevalence, monthly income, and charge per service)

Peareang (HNI)	Preah Sdach (RHAC)	Kirivong (SRC)
1) All cadres conducted. 2) Estimated income Doctors around $1000 Assistant Doctors $600 to $700 Nurses and midwives (primary) $100 to $150 3) Typical charge paid by a patient for one time $2.5 to $10	1) All cadres conducted. 2) Estimated income Doctors and Assistant Doctors: $300 to 400 Nurses (Secondary) $200 to $300 3) Typical charge paid by a patient for one time $2.5 to $10	1) All cadres except primary nurses and midwives. They did almost only where the secondary nurses did not conduct dual practice. 2) Estimated income Doctors and Assistant Doctors: $500 to 1000 Nurses and midwives (secondary) $200 to $400 Nurses and midwives (primary) $100 to $200 3) Typical charge paid by a patient for one time $5 to $10

Source: KI02 June 19, 2007, KI13 August 8, 2006, 2005, KI09 September 1, 2007 2012.

Different levels of prohibition of and punishments for dual practice were applied by NGO contractors who considered the negative effects of dual practice on the health worker's performance. Therefore, some reductions of dual practice as well as reductions in income from it were theoretically expected. A previous report mentioned that in one of the CODs, decreases in the income of the subcontractors (health facilities) were attributed to dual practice by health workers (SRC 2006) (outline of SRC Mid-term Review, see Appendix 11).

The intensity of prohibition varied, from total to partial prohibition, one form of which was exactly the same as the MOH rule. Two contractors wrote internal punitive rules and applied them in their districts (Table 5.8). However, although most NGO rules were stricter than the MOH rule, they were considered as supplementary to the MOH rule which were to be primarily abided by. Therefore, the NGO contractors had difficulty in applying punishments (KI01 March 17 2006). Also, since the authority of enforcing punishments was held by the Provincial Health Office whose enforcement of punishments was lenient, punishments were rarely enforced (KI01, August 22 2007; KI04, May 19 2007). As a result, dual practice continued and NGO Contractors admitted their difficulty in prohibiting dual practice, though some reductions were observed (KI04 May 19 2007, KI09, Septemeber 8 2007).

Table 5.8: Prohibitions of dual practice and punishments against dual practice by NGO

	Peareang (HNI)	Preah Sdach (RHAC)	Kirivong (SRC)
Level of prohibition	- complete prohibition by an internal rule - included prohibition of dual practice performed and pharmacies operated by family members of the health workers	- adhering to the MOH personnel rule (prohibition on dual practice during working hours)	- prohibition only during working hours by an internal rule
Method of prohibition	- created more severe rules than the MOH personnel rules	- applied the MOH personnel rules without having own internal rules and penalties	- created more severe rules than the MOH personnel rules, including financial penalties
Punishments applied	- (a few cases) including transferring personnel, by urging the Provincial Health Department	- applied the MOH personnel rules without having own internal rules and penalties	- actual application was almost limited to financial penalties - asked the Provincial Health Department to take punitive actions

Source: Jacobs and Price. 2006. Jacobs et al. 2010, SRC 2006; KI02 May 2006, KI01 March 17 2006, KI04 May 19 2007

HNI and SRC set their own internal rules. The HNI's rules totally prohibited dual practice. If detected, it led to an immediate transfer of the offending personnel to another health facility or even to their dismissal from "secondment" to HNI. SRC prohibited dual practice during working hours, which was similar to the MOH rule, but SRC was stricter in prohibition and urged the PHD to take punitive actions in relation to the person who conducted dual practice and was able to apply their internal rules and cancell the employment contract between SRC and the person after tenatious negotiations with the PHD (KI01August 22 2007; KI04 May 19 2007).

The MOH rule lacked effective enforcement measures, resulting in the widespread dual practice during working hours and the negative effects as described above (Chapter 3) (van Damme et al. 2004; Soeters and Griffiths 2003; MOH 2002; Akashi et al.2004; Vong et al. 2005;).

Some of the health workers in CODs and MODs appeared to trade off longer working hours, more than eight hours, for dual practice with the least leisure time in a day. If they could generate income, they would conduct dual practice during weekends (KI17, April 25 2007; Personal observations). At the extreme, health workers could quit government jobs, seeking higher payment than government salaries, and move to the private sector, mostly to NGOs. After the ADB Pilot Project, as well as DFID/World Bank Project, some of those who had worked for the Operational District contracted out and benefited the extra payment arrangements in the projects, left their government jobs for NGOs (KI11, Augst 14 2006).

Regulations of dual practice was also found at the subcontractor level. The mini-survey of this study revealed that some subcontractors established their punishements for health workers' breaching the prohibition rules set by the NGO. The survey investigated payment allocation methods at the level including criteria and factors influenced the allocation.

5.4 Other noticeable features: health workers' household expenditure

Some household expenditures were associated with the economic status of households, such as educational expenditure in Cambodia (McPake et al. 1996; World Bank 2006; MOEYS and UNICEF 2007). Some health workers in rural areas sent their children away from the area in order to obtain a higher and/or better education in Phnom Penh or other large towns, at high expenses, due to the limited opportunities for receiving higher and/or better education

levels in rural areas (KI16, March 28 2007; KI15, March 23 2007). Alongside these educational expenditure, Cambodian pupils and students in both primary and secondary education are often required to pay their teachers extra tuition fees for extra-curricular classes, which are taught by the same teachers; and also to buy educational materials from them, in order to achieve higher scores in their examinations, despite the fact that fees for primary education were abolished by the government (World Bank 2005; KI15, 24 May 2007).

5.5 Conclusion

This chapter described finding about the payment mechanism, implementation methods of DFID/World Bank Contracting Project concerning the payments, and the incentive environment in the three CODs. The fee-for-services payment mechanism to the subcontractors was also similar among the CODs. The NGO contractors had guidelines for the allocation of performance-based payments to individual health workers. The guidelines appeared to be only vaguely followed because the subcontractor applied their own methods which reflected their strong concern to maintain equality amongst themselves. As a result, the meritocratic features of the payment seemed to be reduced at the individual health worker level.

Dual practice seemed to have prevailed in the three CODs. Findings from the Key informant interviews concering NGO Contracotrs' implementations and from DFID/World Bank Contracting Project's contrcting agreement support this. NGO Contractors established their own insitutunal settings aiming to reduce it, e.g., their own prohibition rules with stricter levels than MOH's rules. The subcontrctors also set up their own punishment on breaching the NGO rules by the health workers. DFID/World Bank Contracting Project required a reduction of dual practice in its agreements with the contrators.

These NGO rules were backeby by enhanced moritoring and the punishments. However, the PHD overrode the authority of applying the enforcement measures and discretionally did not implement the measures, using institutional disreation (Mathauer and Carrin 2010).

Chapter 6 Health workers' incomes and expenditure

6.1 Introduction

This chapter presents the findings concerning comparisons between the Operational districts contracted out (CODs) and the MOH managed Operational Districts (MODs) in respect of differences in: health workers' and their households' incomes and expenditures, and their households' access to basic infrastructures, durable goods, possessions and materials. These findings respond to the first research question and less directly contribute to responses to the second question. The first question compares the expenditures and incomes of health workers. This question was derived from a hypothesis that the payments associated with the contracting setting (DFID/World Bank Contracting Project) might have brought in differences, likely increases, in the incomes and expenditures and features of the households between the CODs and MODs. The features consisted of the access to basic infrastructure, use of costly materials for their houses and possession of consumer goods. Also, a proportion of the income from the government sector and that of the income from dual practice were hypothesised to change due to the payments in the contracting.

This hypothesis postulated that two types of districts held nearly similar socio-economic features and incomes of the health workers except those influenced by the contracting. The similar features as the (quasi) control group were ensured by the selection criteria of MODs as the comparison group (Chapter 4 and Appendix 6). The findings for the first research questions were expected to provide parts of factors (variables) for investigating with regard to the second research question, namely the exploration of factors influencing the incomes and expenditures of these households.

6.2 Collected data

Data collected by the field survey is outlined in this section. As prented in Table 6.1,the numbers of health workers surveyed was 250 of which 156 were from CODs and 94 from MODs. The 250 cases were among the 275 eligible cases, giving a coverage rate of 90.9% (Appendix 9), which responded well to this study's complete enumeration approach (Chapter 4). A total of 156 cases were from three CODs: Peareang, Preah Sdach, and Kirivong districts and 94 were from two MODs: Kamchay Mea and Mesang districts. The two MODs are located in rural areas in the same province as the two CODs, Peareang and Preah Sdach districts are located (Chapter 4).

The lower number of collected cases in MODs was partly due to a sudden cancellation of appointments to complete the questionnaire by some of the eligible health workers in MODs. The investigator was informed of the cancellations on the first day of the field data collection. This occurred despite the fact that these same health workers had been confirmed as being available to participate in the survey by the health Operational District office. The Chief of an MOD explained that the absent health workers were either working or studying outside the district or taking sick or maternal leave.

The structure of collected data appeared to largely reflect the actual structure of the numbers of cadres in rural Cambodia (MOH 2002). Nearly half of the cases were those of nurses. In both CODs and MODs, primary nurses constituted the largest group among the cadres. Doctors, assistant doctors and secondary midwives were minorities. Some Operational District had no doctors or no assistant doctors or no secondary midwives. No females were included among the assistant doctors and doctor and there were no male midwives, which reflected the gender influence on entry to the cadres. Males were also the majority of secondary nurses. These suggest inevitable biases in the data structure of collected data. The biases largely appeared to reflect biases in the deployment of health workers in the Operational Districts since the data (cases) were collected by the approach of complete enumeration. The bias influenced the results of statistical analyses in the following chapters. The mean age of health workers, their household size and children enrolled were similar between CODs and MODs (Table 6.1).

Table 6.1: Collected cases (by district status, cadre, district, by gender, age, household size, children enrolled)

Cases by cadre between CODs and MODs

	CODs	% to the total	MODs	% to the total	Total C/MOD	%
Cadre						
Primary NS	62	39.7	55	58.5	117	46.8
Secondary NS	47	30.1	17	18.1	64	25.6
Secondary MW	13	8.3	5	5.3	18	7.2
Primary MW	29	18.6	14	14.9	43	17.2
Assist Doctors	4	2.6	1	1.1	5	2
Doctors	1	0.6	2	2.1	3	1.2
% to the total	156	100.0	94	100.0	250	100
Gender						
Male	95	60.9	64	68.1	159	63.6
Female	61	39.1	30	31.9	91	36.4
% to the total	156	100.0	94	100.0	250	100

Cases by cadre and district

	Peareang	Preah Sdach	Krivong	Kamchay Mea	Mesang
Primary NS	25	16	21	29	26
Secondary NS	20	5	22	13	4
Primary MW	13	1	15	4	10
Secondary MW	3	1	9	3	2
Assis. Doctor	2	1	1	1	0
Doctor	1	0	0	2	0
Total	64	24	68	52	42
% to the total in C/MODs	25.6	9.6	27.2	20.8	16.8

Cadre by gender between CODs and MODs

	CODs	% to the total	MODs	% to the total	Total C/MOD
Primary NS	48	77.4	44	80.0	92
(female)	14	22.6	11	20.0	25
% to the total	62	100.0	55	100.0	117
Secondary NS	42	89.4	17	100.0	59
(female)	5	10.6	0	0.0	5
% to the total	47	100.0	17	100.0	64
Primary MW	29	100.0	14	100.0	43
Secondary MW	13	100.0	5	100.0	18
Assist Doctor	4	100.0	1	100.0	5
Doctor	1	100.0	2	100.0	3

Health workers' age, household size, children enrolled (mean)

	CODs		MODs	
Age of health workers	41.8	S.D. = 8.2	42.1	S.D.=7.0
Number of household	5		5	
Children enrolled	1.9		2	

Both CODs and MODs had closely similar variations in the number of household members (Figure 6.1).

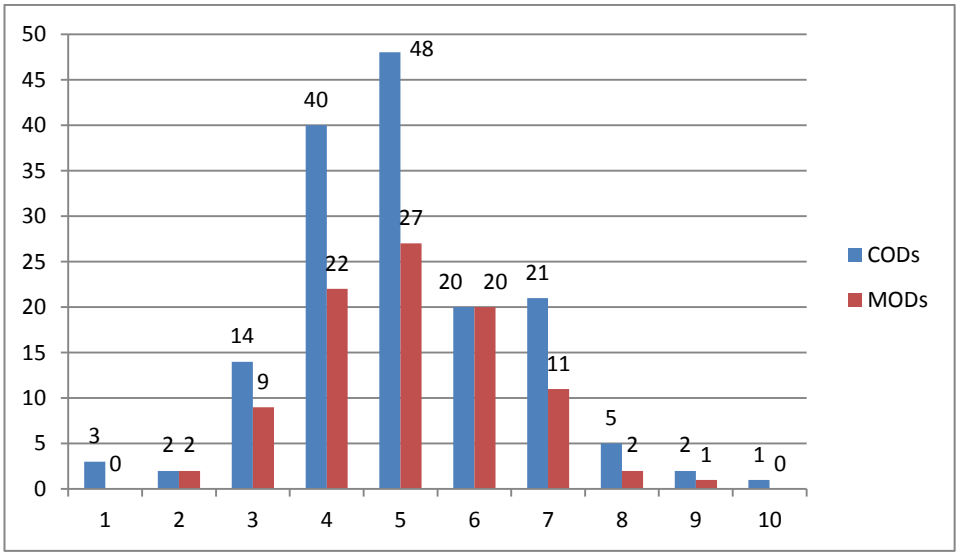


Figure 6.1: Number of household members of health workers' households by Operational District

The selection strategy of this study chose MODs based on their underlying similarity to CODs in their socio-economic features and health development supports (Chapter 4). Upon the similarity of socio-economic features, the similarities identified in the collected data seemed to accommodate maximum quasi-experiment settings in the context of social science in which RCT-experiments are almost impossible (Chapter 4). As illustrated below, survey collected data also indicated the similarity in the mean government regular payments (Table 6.2). The mean supplementary salaries and per-diems (Table 6.2) received in the government sector indicated that the MODs' were 'not heavily' supported by NGOs or bi- or multilateral cooperation organisations (Chapter 4). Thus, the mean confirmed that MODs were 'not heavily' supported, implying that the monetary support received by MODs from the outside were nearly similar to CODs, except that the COD's received payments associated with the contracting settings (Table 6.2) .

6.3 Incomes of health workers in district contracted out and not contracted out

6.3.1 Incomes compared

Table 6.2 shows the means of incomes in health workers' households with their proportions of the total household income and of the total income from health work including private practice.

Table 6.2: Means and proportion of health workers' and their household income in CODs and in MODs (US$)

	COD (N=156)	%	MOD (N=94)	%	P-value	CODs and MODs (N=250)	%
Government regular payments	427.5	15.0	422.7	15	0.961	425.7	15.0
S.D.	123.3	(22.0)*	110.8	(21.3)*		118.5	(21.7)
Honorariums	2.4	0.1	6.3	0.2		3.9	0.1
S. D.	17.3	(0.1)*	33.2	(0.3)*		24.5	(0.2)
Those who received	(N=9)			(N=6)			(N=15)
S.D.		42.4		97.9			64.6
Mean		62.6		98.4			80.6
Supplementary salary and per-diem	279.2	9.8	210.2	7.5	0.343		
S.D.	318.7	(14.4)*	232.1	(10.6)*		248.7	8.9
		(22.8)**				290.6	(12.9)
Those who received	(N=128)		(N=82)			(N= 210)	
Mean		340.3		241			301.5
S.D.		321		233.1			293.3
Share from user-fee income	301.2	10.6	114	4.1	0.000	230.8	8.2
S.D.	329.4	(15.5)*	124	(5.8)*		285.6	(11.8)
		(24.6)**					
Those who received	(N=110)			(N=79)			(N=189)
Mean		427.2		135.7			305.4
S.D.		316.2		124			291.8
Performance-based payment	642.8	22.6	N/A	N/A	N/A		
S. D.	518.5	(33.0)*	N/A			401.1	14.2
S. D.	512.2	(52.5)**	N/A			514.5	(20.5)
Income from private practice	292.1	10.3	1,227.00	43.6	0.000	643.6	22.7
S. D.	971.3	(15.0)*	2,731.50	(62.0)*		1,892.00	(32.9)
Those who received		(N=36)*		(N=70)*			(N=106)*
Mean		1,265.6		1,647.7		1,517.90	1,517.9
S. D.		1,706.1		3,058.2		2,673.80	2,673.8
Economic activities other than health work	900	31.6	831.8	29.6	0.726	874.3	30.9
Mean	3,179.0		3,149.1			3,161.8	
Household earned	(N=114)			(N=84)			
Mean		1,637.5		2,313.9		(N=160)**	
S. D.		3,771.7		4,469.2		1,393.1	
Total household income	2,845.3	100	2,811.9	100	0.000	2,832.8	100
S. D.	3,499.8		4,434.9			3,859.2	

( )* perentage in income from health work

( )** perentage in payment associated with the contracting settings

HH*: household

P-value : result of Mann-Whitnny test (two-tailed)

(1) The total household income

Total household incomes were nearly the same, despite the structure and amount of each item seeming to show differences between CODs and MODs as presented in Table 6.2. The payments associated with the contracting settings in CODs, which is illustrated below, and the income from private practice in MODs account for the structural differences. The payments associated with the contracting settings made the income from health work excluding private practice more than double that in MODs. Consequently, they made the COD health workers' total household income comparable to that of MOD health workers', despite higher private practice income earned in MODs, and given the minimal difference between CODs and MODs in income from other economic activities (Table 6.2).

(2) Government regular payments

Between CODs and MODs, the means of government regular payments was close (Table 6.2) and the two data sets were not statistically different (p-value, two-tailed = 0.911 > 0.05)[5]. The government regular payments (Table 6.2) made a limited contribution to the total household income in CODs and MODs, and even to their total income from health work (including private practice). Nevertheless, the government payment was the second highest income item after the income from private practice (Table 6.2).

(3) Payments associated with the contracting settings

Payments associated with the contracting settings included performance-based payments, supplementary salaries and per-diems, and a share of user-fee income. In both CODs and MODs, the majority of the health workers are secondary and primary nurses and secondary and primary midwives. Therefore, the payments associates with the contracting settings were further analysed for these four cadres in CODs. Through performance-based-payments and supplemental salaries and per-diems, health workers in CODs earned almost half of their income from health work and around 30 % of the total household income. Additions of the share from the user-fee income raised the two values to more than 60% and 40% (Table 6.2).

Across the four main cadres in CODs, the payments associated with the contracting settings (the total of performance-based payments, supplementary salaries and per-diems and the share from user-fees) reached more than 50% to their total household income and close to 65% to their income from health work including private practice income (Table 6.2).

[5] Mann-Whitney U Test.

Some cases of performance-based payments were reported as supplemental salaries and per-diems as explained above, because of the lack of the vocabulary for differentiating them in the Khmer language. Understanding by the surveyors about distinctive definitions for different payment categories were promoted in training and the data collection manual and through guidance during fieldwork. However, conceptual confusion between the two types of payments remained which were not found before the data collection, and these were shared with the questionnaire respondents. The confusion was confirmed by the fact that eight health workers in CODs did not report receiving any performance-based payments. Instead they reported higher supplementary salaries and per-diems; the mean of their supplementary salaries and per-diems (US$541.8) was almost 1.7 times that of the mean of performance-based payments (US$321.9) of the other health workers in CODs who received these payments.

1) Performance-based-payments

Performance-based-payments might be regarded as the core financial incentive among those payments associated with the contracting settings. The mean of this income surpassed the mean income from private practice in CODs (Table 6.2). The mean amounted to almost half of the total of the payments associated with the contracting setting and the user-fee income (Table 6.3). Cadres at the primary level appeared to have benefited more from these payments than those at the secondary level (Table 6.3).

2) Supplemental salaries and per-diem

The mean of supplementary salaries and per-diems was higher in CODs than MODs. The difference in this income was not significant between CODs and MODs (p-value, two tailed =0.343 > 0.05[6)].

In MODs, the overall mean of the contribution rates from supplementary salaries and per-diems was around 10% in the four cadres (Table 6.3). The low contribution seemed to be attributed partly to this study's selection strategy of MODs as the control group, as described above (Chapter 4).

3). Share from user-fee income

The mean of share user-fee income in COD was three times higher than in MODs (Table 6.2). The difference in this income between CODs and MODs was significant (p-value, two tailed

[6] Mann-Whitney U Test.

=0.000 < 0.05)[7]. It seemed reasonable to attribute these increases in user-fee income in CODs to the contracting setting which intended to increase health service delivery.

Among the four majority cadres in CODs, nurses received more than double the amount of the shares received by nurses in MODs.

Midwives in CODs benefitted lower from the share than nurses in CODs. Midwives in MODs benefited more than nurses in MODs. Secondary midwives in CODs benefitted higher than those in MODs (Table 6.3).

Table 6.3: Contributions of payments associated with the contracting settings to their income and total household income in four cadres in CODs (%)

CODs	**Performance-based payments and supplementary salaries and per-diems**	**Share from user-fee income**
Primary NS (N=62)	50.0(41.6)	18.0(15.2)
Secondary NS (N=47)	45.1(34.7)	15.9(12.6)
Primary MW (N=29)	55.4(44.8)	13.9(12.3)
Secondary MW(N=13)	45.8(39.6)	15.9(13.7)
Four Cadres (N=151)	49.2(40.2)	15.9(13.5)
MODs	**Supplementary salaries and per- diems**	**Share from user-fee income**
Primary NS (N=55)	18.6(16.6)	8.2(7.0)
Secondary NS (N=17)	15.4(13.8)	6.7(5.1)
Primary MW (N=14)	8.9(7.6)	18.3(14.3)
Secondary MW (N=5)	5.7 (5.7)	12.1(8.0)
Four Cadres (N=91)	12.2(10.9)	11.3(8.6)

( ) percentage to the total household income

(4) Income from Private Practice

Despite the enhanced prohibition of dual practice by NGO contractors in CODs (Chapter 5). 106 of the 250 health workers obtained income from private practice; however, the prevalence of private practice was lower in CODs than in MODs (details in Table 7.2).

[7] Mann-Whitney U Test.

The difference in the private practice income between CODs and MODs was significant (p-value, two-tailed = 0.000 <0.05).

In CODs, the ratio of mean private practice income was around 10% of their total household income but in MODs it was more than 40% (Table 6.2). Between CODs and MODs, there was not much difference in the mean private practice income among those who actually received it (Table 6.2). However, in MODs, disparity of this income among those who received it seemed to be larger in CODs (Table 6.2).

(5) Honoraria

Honoraria contributed to the total income of health workers and, to a limited extent, to their total household income. However, among the households who received honoraria, the mean in MODs was more than double that in CODs (Table 6.2).

(6) Income from sources other than health work

Income derived from sources other than health work (income from employment of other household members and from household enterprises excluding private practice) was hypothesised to be a meaningful proportion of the total household income of the health workers, because of the characteristics of income diversity households in LMICs (Deracon 2002) and Cambodia (KI15, March 15 2007). It was also hypothesised to be intricately linked to health workers' income, including income from private practice, based on the notion of a household as an economic unit.

In both CODs and MODs, this category of income reached around 30% of the total household income. This indicates, however, that the health workers income from health work was significant, contributing 70% of the household income (Table 6.2).

Cadre or the status of the district might have influenced this income. The importance of this type of income by cadre: nurses and midwives, showed similarities between CODs and MODs (Table 6.4). This type of income was more important to nurses than to midwives in both CODs and MODs. In CODs, the importance seemed to be particularly high for primary nurses; in MODs, the importance was high for secondary nurses (Table 6.4).

(7) Income from health work excluding private practice (income in the government sector)

The category of income from health work excluding private practice consisted of the government regular salaries, supplementary salaries and per-diems, and a share from the user-fee income, i.e., the payments associated with the contracting settings in CODs. This category of income showed distinctive differences between CODs and MODs in four cadres. In CODs, the mean of this category of income reached at least half of the mean total household income; the highest was over 70%. However, in MOD, the highest income is almost half, but the lowest is nearly 20% of the mean total household income. Among primary midwives in both CODs and MODs, the ratio for the mean private practice income was the lowest (Table 6.4).

Table 6.4 Three income compositions of the total household income by status of Operational District by cadre and their percentage to the total household income

	Health work excluding private practice	Private practice	Economic activities other than health work	Total (household income)
CODs(N=156)				
Primary NS (N=62)	1666.3	238.6	1159.3	3064.2
	(54.4)	(7.8)	(37.8)	(100.0)
Secondary NS (N=47)	1798.9	503.8	1038.1	3340.9
	（53.8）	(15.1)	(31.1)	(100.0)
Primary MW (N=29)	1239.5	10.7	444.2	1694.4
	(73.2)	(0.6)	(26.2)	(100.0)
Secondary MW (N=13)	1843.4	521.4	432.9	2797.8
	(65.9)	(18.6)	(15.5)	(100.0)
MODs (N=94)				
Primary NS (N=55)	757.3	1387.4	640.5	2785.3
	(27.2)	(49.8)	(23.0)	(100.0)
Secondary NS (N=17)	907.5	1345.3	2078.7	4331.5
	(21.0)	(31.1)	(48.0)	(100.0)
Primary MW (N=14)	561.1	203.7	222.3	987.1
	(56.8)	(20.6)	(22.5)	(100.0)
Secondary MW (N=5)	632.1	484.2	329.7	1446.0
	(43.7)	(33.5)	(22.8)	(100.0)

6.3.2 Benefits from the contracting project : net income differences

Net income increases of health workers in CODs arising from the contracting settings was US$899.9 (Table 6.5. For addition of supplemental salary and per-diem, see 6.3.1 (3)).

Table 6.5: Net annual income difference of health workers in CODs arising from the DFID/World Bank Project (US$)

	A: CODs	B: MODs	Benefit in CODs (A – B)
Performance-based payment	642.8	0	642.8
Supplemental salary and per-diem	279.2	210.2	69.0
Share from user-fee income	301.2	114.0	187.2
Total	1,223.2	324.2	899.0

Two of the CODs and all MODs belong to Prey Veng Province and their economic statuses were similar (Chapter 5). Among these four districts, the payments associated with contracting, including the user-fee income received by the COD workers, nearly superseded income from private practice received by the MOD workers (Table 6.6). Another COD, Kirivong in Takeo Province received a lower total from the payments associated with contracting settings (Table 6.6). This is despite the fact that Kirivong's economic status was slightly higher than the other four provinces.

However, the private practice income in Kirovong was still lower than in the two MOD districts in Prey Veng Province whose economic statuses were lower than Kirovong (Table 6.6). The private practice income in Krivong seemed to indicate that health workers in Kirivong were more likely to conduct private practice than those in the other two CODs as seen in the higher rate of their conducting private practice (44.1%) than those in other CODs (7.7% and 8.3%). Possibly, because of Kirivong's higher economic status, prices of private services might be higher. However, it is noted that those in Kirivong might still reduce dual practice, if their private practice income is compared with that in the two MODs. They might have been able to earn the same private practice income as the health workers in the two MODs.

Table 6.6: Annual payments associated with the contracting setting and private practice income in the two CODs and the two MODs (Prey Veng province) and in Kirivong (Prey Veng province) (US$)

Prey Veng Province	COD		MOD	
	Peareag	Preah Sdach	Kamchay Mea	Mesang
1 Performance-based payment	845.3	646.5	0.0	0.0
2 Supplementary salary and per-diem	253.6	447.6	146.9	204.0
3 Share from user-fee income	165.8	322.1	84.4	152.1
Total (1 + 2 + 3)	1264.7	1416.2	231.3	356.1
Private practice	155.4	69.5	1386.7	1029.3
Grand Total	1420.1	1485.7	1618.1	1385.4
Takeo Province	**COD**			
	Kirivong			
1 Performance-based payment	438.6			
2 Supplementary salary and per-diem	240.2			
3 Share from user-fee income	420.2			
Total (1 + 2 + 3)	1090.0			
Private practice	499.2			
Grand Total	1598.2			

Note: two income items except the private practice income in MODs were not paid by DFID/World Bank Project.

6.3.3 Comparison with previous studies

The health workers' households seemed to be slightly better-off than the average Cambodian household, when their per capita household income was compared with the Gross National Income (GNI) per capita. The per capita household income in CODs (784 household members) and in MOD (471 household members) were close: US$511.2; US$555.3. Both of these were 1.2 times higher than the GNI per capita US$480.0 in 2001 by World Bank 2008 (World Bank 2008).

Jacobs et al. (2009) presented the monthly income of health workers in Kirivong OD. In the current study, the mean annual incomes of health workers were converted to monthly incomes. The converted monthly incomes included incomes in both CODs and MODs. Comparisons of the findings between these monthly incomes and the monthly income presented by Jacobs et al. (2009) suggests a lower range of health workers' incomes found in the current study (Table 6.7).

Table 6.7: Monthly income from health work excluding private practice found in this study and Jacobs et al. (2009) (US$)

This study				Jacobs et al. (2009)
CODs and MODs (N=250)	**CODs (N=156)**	**MODs (N=94)**	**Kirivong (N=68)**	**Kirivong**
109.4	137.8	62.8	126.6	159.0

However, in addition to the US$159.0, the supplementary salary of the tuberculosis and HIV programme was paid (Jacobs et al. 2010), consequently, a total of between US$189.0 and US$210.0 might have been paid to some of the workers, enlarging the gap between the two studies.

Health workers surveyed by the MOH Incentives Study (MOH 2005) (referred to in the Chapter 2,) received lower government salaries than those surveyed by this study. The salaries were lower in even those with high qualifications, i.e, Grade A, that health workers

in rural areas seldom possess (Table 6.8)**.** This contrasts with an expectation that the regular government payments to Grade A groups would have been higher than those of the health workers surveyed by this study because of the Grade A group's qualifications. This study identified the mean of regular monthly government salaries as US$35.0 among all cadres, which was annualized to US$420.0. This mean was higher even than that of the Grade A, found in the MOH Incentive Study (Table 6.8). The unexpectedly low payment might in part be connected to the timing of the Study in 2004, before the government officials 15% pay rise in 2006. However, this rise is still insufficient to fully explain the lower payments.

Table 6.8: Comparisons of incomes between the MOH Incentive Study and this study (annualized, US$)

	Government payment:	**Private practice income**	**Total income**
MOH Incentive Study (Grade A) doctors, dentists, pharmacists	336.0 (Monthly 28.0)	Specialist: 4,800.0 Generalist: 3,000.0-3,600.	:5,400.0
This study (Doctors) (N=3)	N/A	N/A	N/A
MOH Incentive Study (Grade B) assistant level staff of doctors, dentists, secondary primary laboratory technicians, "some" secondary midwives and nurses	240.0 (Monthly: 20.0)	1,200.0	1,200.0 – 1,560.0
This study (Assistant Doctors) (N=5)	N/A	N/A	N/A
MOH Incentive Study (Grade C) primary and secondary midwives and nurses , primary laboratory technicians	156.0 (Monthly: 13.0)	1,200.0	840.0
This study (Nurses and Midwives) (N=242)	418.8	595.0	1895.5

Note: Data from the MOH Incentive Study were the medians.
Source: Government payments for the MOH Incentive Study (MOH 2005) were calculated from data of monthly payments in P. 2 and private practice income from P.7, P.29 Table A7. Private practice income and Total income were from P.5, those of Grade C was estimated from Figure 4 on P. 5 of the study (MOH 2005). MOH 2005. p. 33, 5.5.

The finding of the MOH Incentive Study presented higher private practice income than those earned by the health workers in this study. The private practice income of the Grade A group

(Table 6. 8) exceeded even the mean total household incomes of health workers: US$2,832.8 in CODs and MODs (Table 6.2). Comparisons of the Grade A with the doctors and assistant doctors were unavailable because of the limited number of such case in this study. The higher income may be caused by the samples of the MOH Incentive Study which included higher proportions of health workers with high qualifications and those who were seldom working in rural Cambodia (Personal Observation). The area where samples were collected also seemed to influence the higher income. The areas included Battambang Province whose provincial town was the second largest city and Kampong Cham Province, which was developing as a suburban residential area for Phnom Penh.

The mean private practice income of nurses and midwives (as a group) in this study was lower than that of Grade C group samples of the MOH Incentive Study. It is noted that Grade B included "some" secondary nurses and secondary midwives who were in specific managerial positions, but these nurses and midwives, such as Chief or sub-Chief of a MCH division of a Referral Hospital, seemed to be working less frequently at Health Centres from which this study collected the cases (Personal Observation). A factor which may account for the lower private practice income was the reduced labour supply in private practice by the health workers in CODs. The reduction of labour supply might have been caused by: the increases in labour supply in government health work due to their aim of increasing income; the higher marginal return from government work as a result of contracting incentives; the stricter prohibition of private practice by NGO Contractors in CODs.

The total annual income of the nurses and midwives surveyed by this study was at a higher level than that of the Grade B and C group of the MOH but not higher than the Grade A group in the MOH Incentive Study as shown in Table 6.8. This fact contrasted with lower qualifications and lower private practice income of the nurses and midwives, and the possible lower economic status of CODs and MODs, than that of the area where the MOH Incentive Study took place.

The MOH Incentive Study found that the Grade A group would be satisfied with a total monthly income of US$110.00 for working 40 hours a week for the government without giving up private practice completely (MOH 2005)[8]. The US$110.00 which was satisfactory to the Grade A group was compared with the monthly incomes of US$157.91 (of which the

[8]The MOH Incentive Study also asked the sample health workers (including non-technical staff) in the Grade A group about their willing to receive. They were willing to receive US$400.00 of their total income per month from government work if this meant they had to give up their private practice.

annualized amount, US$1,895.5 seen in Table 6.8) of nurses and midwives in this study. Then, the nurses and midwives seemed to earn a reasonable range of incomes if their qualifications and the location of CODs and MODs were considered.

6.4 Conclusion on Incomes

In CODs, the payments associated with the contracting settings appeared to be a substantial amount of the health workers' income as well as their household income. They earned nearly 60% of their income for health work from these payments. The payment was around 40% of the total household income (Table 6.2).

To each cadre group in CODs, the income brought in from the health work excluding private practice was significant, i.e. the income from the government sector, reaching to at least half of the mean total household income; the highest was over 70% of income (Table 6.4). However, to each cadre group in MODs, this income varied from nearly 20% at the lowest, to almost half of their total household income (Table 6.4). The mean of this income was 1.2 times higher in CODs than in MODs (Table 6.2).

Private practice income was 15.0% of the income from health work and 10% of the total household income in CODs. However, the proportions of private practice income were more than 60% of the income from health work and 40% of the total household income respectively in MODs. The private practice income in CODs was a quarter of that in MODs (Table 6.2).

The increases in income in the government sector seemed to indicate that labour supply increased in the government sector because of increases in income through the payments associated with the contracting settings. Also, the differences in the income in the government sector as well as in the private practice income between CODs and MODs seemed to show a transfer of labour supply between the government and private sector in CODs.

In CODs, among the four major cadres, the primary level health workers appeared to benefit more from payments associated with the contracting settings. Disparity in the income in the government sector between nurses and midwives was narrower in CODs than in MODs. The incomes of nurses and midwives were closer in CODs than in MODs (Table 6.4).

6.5 Household expenditures of health workers in CODs and MODs

6.5.1 Household expenditures compared

(1) Total household Expenditure

Health workers' total household expenditure aggregated (Table 6.9), almost $3,600.0 in all cases, would have been unattainable by the quoted level of government regular payments alone. This corresponds with the hypothesis of this study that the health workers had different income sources. This also further underpins this study's argument that the impact of the payments associated with the contracting settings needs to be examined by their impact on their total household income.

The mean total household expenditure was between 12 to 16 times that of the annualized amount of the quoted government monthly payments: $10.0 to $30.0 per month (Soeters and Griffiths 2003; Akashi et al. 2004). The total household expenditure was higher in CODs than in MODs. The difference in this expenditure was statistically significant (p-value = 0.002, two-tailed < 0.005)[9] .

[9] Mann-Whitney U Test.

Table 6.9 Mean and proportion of household expenditures in CODs and MODs (US$)

	COD (N=156)	%	MOD (N=94)	%	P-value	CODs and MOD (N=250)	%
Food	1,284.00	33.8	1,335.70	41	0.436	1,303.50	36.3
S.D.	523		875.0			675.9	
Non-food Daily	600.4	15.8	505.2	16.2	0.03	572.6	15.9
S.D.	398.9		392.7			399.7	
Non-food Annual	592.4	15.6	486.4	14.9	0.047	552.6	15.4
S.D.	865.7		350.3			717.6	
Education	602.3	15.8	347.6	11.5	0.037*	516.7	14.4
S.D.	799.7		512.2			713	
HHs* which incurred		(N=132)	(N=91)			(N=223)	
Mean		711.8	387			579.2	
S.D.		823.6)	516			730.6	
(Education away from home)							
	291.2		127.0		0.005	-229.5	
S.D.	684.2		454.3			-612.2	
HHs* which incurred		(N = 42)	(N = 11)			(N=53)	
Mean		1,081.60	1,085.00			1082.4	
S.D.		945.5	880.2			924	
Health Service	379.8	10	156.3	4.8	0.013	295.8	8.2
S. D.	731.8		393.9			634.9	
HHs* which incurred		(N=61)	(N=17)			(N=78)	
Mean		931.6	768.1			896	
S. D.		904.4	592.3			845.5	
Utility	269.5	7.1	230	7.1		254.7	7.1
S.D.	241.6		1,628.10			186.4	
Rent							
Mean	5.4	0.1	0.4	0		3.5	0.1
S.D.	27.6		3.7			22	
HHs* which incurred		(N=6)	(N=1)			(N=7)	
Mean		140	36			125.1	
S. D.		31	N/A			48.4	
Economic activities other than health work	67.8		79.1			96.5	2.7
S. D.	17.9	1.8	203.5	4.4		28.1	
HHs* which incurred		(N=37)	(N=36)			(N=71)	
Mean		285.7	379.8			125.1	
S. D.		389.4	1040.2			48.4	
Total	3801.7	100	3,254.10	100	0.002	3595.8	100
S. D	1822		1,743.30			1,808.90	

HH*: household P-value: result of Mann Whitnny U test (two-tailed)

Note: The 'non-food daily' and 'non-food annual' expenditures do not automatically mean daily or annual expenditures on all non-foods. They comprise items consumed almost daily and in longer term than daily. These categories and other categories were adopted from LSMS World Bank (Chapter 4).

(2)Food expenditure

The mean food expenditure and the proportion of that expenditure to the total household expenditure in CODs was lower than in MODs (Table 6.9). The economic status of households in CODs was understood to be higher than in MODs, according the Engels' Law (Mankiw 2011). Between CODs and MODs, food expenditure was not statistically different (p-value = 0.436, two-tailed, > 0.05)[10].

(3) 'Non-food daily' and 'non-food annual' expenditures

'Non-food daily' and 'non-food annual' expenditure had specific definitions as noted above.

'Non-food daily' expenditure was expenditure on 13 items of goods and services consumed on nearly a daily basis. They include, for example, fuels for cooking, toiletries, fuels for motorbike and car for non-business purposes, and transportation services for individuals (motorbike, chicro, buses and trucks). This expenditure was higher in CODs than in MODs. The proportion of this expenditure to total household expenditure was almost the same (Table 6.9); however, the two data sets of these expenditures were significantly different statistically (p-value = 0.03 two-tailed < 0.05)[11].

'Non-food annual' expenditure was expenditure on ten items relating to goods and services consumed much less frequently than those in the 'non-food daily' group. They included, for example, wedding and funeral ceremonies, clothes, footwear, bags, plates, batteries; and materials for minor repair or maintenance of housing. The expenditure reported varied widely among the responding households (Table 6.9). Similarly to the 'non-food daily' expenditures, 'non-food annual' expenditure was higher in CODs than in MODs (Table 6.9) and the two data sets of these expenditures were significantly different statistically (p-value = 0.047, two tailed < 0.05)[12].

In CODs, on 'non-food annual' expenditure, households of secondary midwives showed distinctive features in the four cadres. The mean of this expenditure was the second highest

[10] Mann-Whitney U Test
[11] Mann-Whitney U Test.
[12] Mann-Whitney U Test.

ratio to the total household expenditure, following the food-expenditure (Table 6.9). The reason for this was unavailable; they might perhaps be paid highly for wedding or funeral ceremonies (Ebihara 1969).

(4) Educational expenditure

Educational expenditure was found to be higher in CODs than in MODs, indicating a higher economic status of health workers' households in CODs than in MODs. Educational expenditure is one of the important variables reflecting the economic status of Cambodian households (Bollen 2001; World Bank 1999, 2006; Ministry of Education, Youth and Sports of Cambodia: MOEYS and UNICEF 2007) as explained in Chapter 4. The mean of their educational expenditure in their households was US$516.7 (Table 6.9), which was 15 times the national mean shown in the CSES 2004 study (MOP 2006), thus indicating their higher economic status. Higher levels of education received by their children (the net 'upper' secondary school enrolment rate: 79.8%) than the national average supported this higher expenditure. The national net secondary school enrolment rate was 22% female, 35% male (MOEYS and UNICEF 2007). Furthermore, 9.4% of the households had more than one child enrolled in university.

The mean of educational expenditure and the ratio of this expenditure to total household expenditure in CODs were higher than those in MODs (Table 6.9), while the mean number of the children was almost the same between CODs: 1.9, and MODs:2.0 (Table 6.1).

However, differences in the expenditure data sets of CODs and MODs were not statistically significant. After the 5% trimming on the data sets, the difference was significant (p-value =0.037 two-tailed < 0.05)[13]. The 5% trimming excludes the outlier-cases which compose 5% of the total number of samples; 2.5% from each of the highest and the lowest outliers. From the 250 cases in this study, 13 outliers in total, seven from the highest and six from the lowest, were excluded. As a result, 237 cases (N=144 in CODs, N=93 in MODs) were tested. The mean of the trimmed data (N=237) was US$441.9. The mean number of children was the same in the trimmed data between CODs (1.93) and MODs (2.09).

Expenditure on education away from households

The expenditure on the education away from households saw higher spending by households in CODs than those in MODs. The proportion of the mean to the total household expenditure

[13] Mann-Whitney U Test.

in CODs was almost double that of the mean in MODs (Table 6.9). The expenditure in CODs and MODs were statistically different (p-value = 0.005 two tailed < 0.05)[14].

(5) Other expenditure

1) Health expenditure

Total health expenditure consists of expenditure on general health services and on maternal and child health (MCH) services. The mean health expenditure in CODs was more than double that in MODs (Table 6.9). The difference in these two data sets was statistically significant (p-value, two-tailed: 0.013 <0.05)[15]. However, ambiguity about the health expenditure disturbed differentiating the economic status between CODs and MODs. Some households responded to additional questions concerning health services they received which they were not required to pay for. These unpaid health services included those provided by the health workers themselves or by a friend of the household. There was no information about what charges for health services the health workers' households should have paid instead of their receiving free health services.

Given the higher health expenditure in CODs than in MODs, it is noted that the number of households which paid for health services was 61 out of of 156 (39.1%) in CODs but only 17 of the 94 households (18.1%) in MODs (Table 6.9). Various assumptions may be possible about the reasons for the higher expenditure and the higher percentage in CODs could be made in relation to free health services. However, almost no information about free health services to health workers was found in the literature about the ADB/DFID Pilot Project and the DFID/World Bank Contracting Project. No information was found in this study's investigations: the key informant interviews and the mini-survey. This point will be further discussed in Chapter 8.

Some health workers reported use of tertiary level facilities or private facilities which required high health expenditure. This is also further discussed Chapter 8.

2) Utility expenditure

Almost all the surveyed health workers' households paid mobile telephone and electricity charges (90.4% and 98.0%). Paying for water or garbage collection was uncommon. The means of this category of expenditure represented a limited proportion of total household expenditure (Table 6.9). The electricity was not necessarily connected to power plants. Underdeveloped infrastructure and social service availability in their rural location do not

[14] Mann-Whitney U Test.
[15] Mann-Whitney U Test.

appear to be significant constraints to them. Their expenditure in this category might be related to their work demands.

The mean utility expenditure in CODs was slightly higher than that in MODs (Table 6.9). The difference was statistically significant (p-value, two-tailed 0.023 < 0.05)[16]. Housing rents were paid by a small number of households and the mean (N = 250) was low. The mean rent was higher in CODs than in MODs (Table 6.9). The small number may be related to the generally high level of home ownership in rural Cambodian households (Personal observation).

3) Expenditure for household economic activities other than health work

Most of the households that conducted enterprises achieved a net income (profit), but some incurred a net expenditure (loss) (Table 6.9). The mean of total household expenditures (net loss) from economic activities other than health work was lower in CODs than in MODs (Table 6.9).

4) Non-aggregated expenditures

Expenditure items which related to savings and investments were not included to the total household expenditure as explicated in Chapter 4 (Deaton 1997).

6.5.2 Comparison with previous studies

Households of the health workers held high economic status in Cambodia. Per capita total household expenditure of health workers (US$708.6) was slightly lower than that in Phnom Penh (US$879.0) in CSES 2004 (MOP 2006). The Phnom Penh data was calculated by this study from the data in CSES 2004 (MOP 2006). However, per capita total household expenditure in CODs and in MODs still belonged to a higher stratum of the higher economic quintile of Cambodian households (Figure 6.2).

[16] Mann-Whitney U Test.

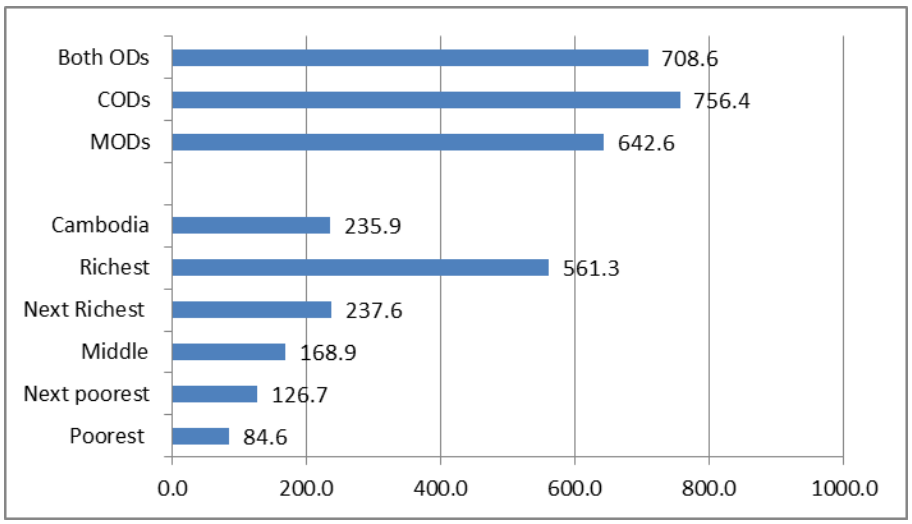


Figure 6.2: Per capita annual household expenditure of health workers' households in CODs and MODs and of economic quintiles in Cambodia (US$)
Source: The quintile data was calculated from MOP 2006.

A comparison with four sub-groups of the ecological-agricultural divisions[17] confirmed the high economic status of their households. Their households' per capita expenditure was only behind those in the urban area in Phnom Penh, the wealthiest area in many analyses of economic status in Cambodia (Figure 6.3).

[17] The ecological-agricultural divisions reflect the importance of the primary industry in the country influenced largely by the ecological and physical settings (World Bank 2005; MOP 2006) which were underlined by the ecological system of Tonle Sap Lake, the largest pure water lake in Southeast Asia and the that of the Mekong River (Sokhem and Sunada 2006; Nouteva et al. 2010).

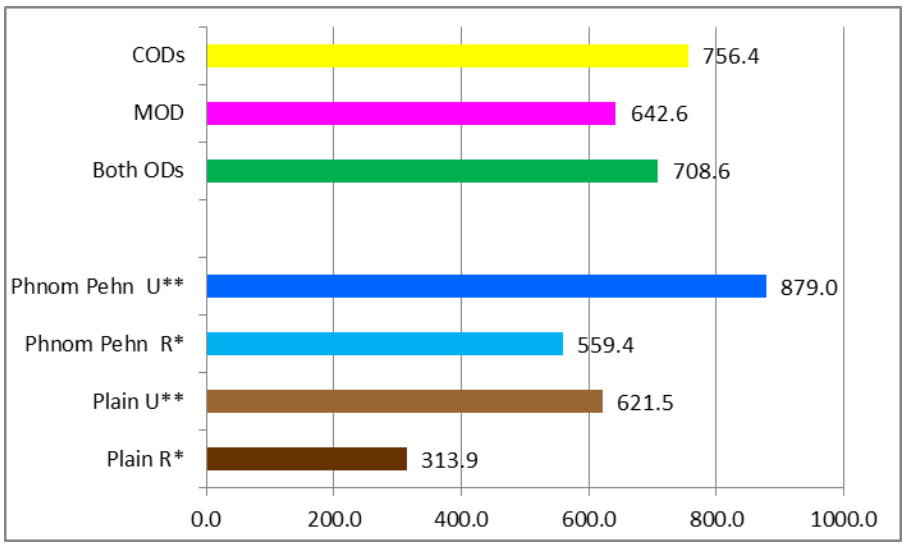


Figure 6.3: Per capita household expenditure of health workers' households in CODs and MODs and by geographical-division of Cambodia
UUrban, and R*Rural according to the definitions of the study (World Bank 2006).**
Source: The 4 regional data sets were calculated by this study from World Bank (2006, P.24 Figure 2.5) which used CSES 2004 data.

The percentage of non-food expenditure (63.7%) in the total household expenditure of health workers was higher than in the richest economic quintile in Cambodia as a whole. The richest quintile had 56% non-food expenditure, which was calculated by this study using data from the MOP (MOP 2006).

6.5.3 Comparison between the total household expenditure and income

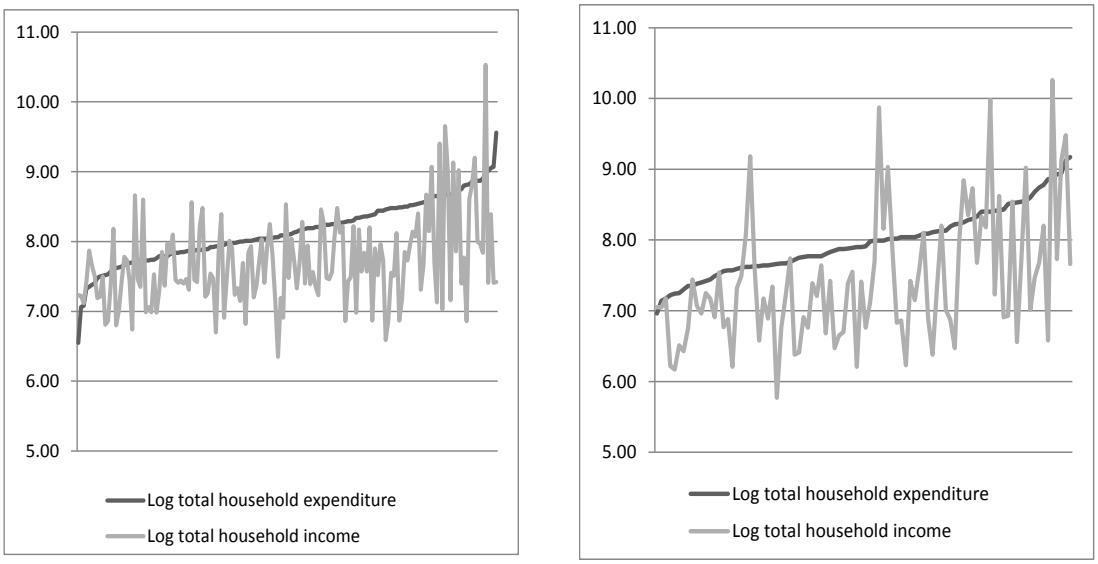
In this study, the issues of under- reporting of health workers' and their household income, (Chapter 4) (Deaton 1997), was addressed by asking the detailed questions about the income, measuring the total household expenditures and then comparing the total household income and expenditure (Deaton 1997), as explained in Chapter 4. The study measured the mean total household income to be around 70% of the mean total household expenditure in both CODs and MODs (Table 6.2, 6.9).

In addition, the accuracy of the income reported by this study was confirmed by an investigation of the relationship between the measured household expenditure and income. This investigation drew on the approach which was applied by Deaton (1997) based on the fact that household consumption is a function of household income determined by the marginal propensity to consume. It was also based on the assumption that the permanent income and the total expenditure of a household have log normal distribution (Battistin,

555Blundell, and Lewbel 2009).

The log of the total household expenditure and of the total household income in CODs and MODs were illustrated in the form of a graph (Figure 6.4). The households were ranked from low to high by total household expenditure. Then a graph was created according to these rankings, presenting two lines: that of log of total household expenditure and that of total household expenditure for the same households (Figure 6.4). This graph checks the directions of and disparity/distance between the two lines (Deaton 1997).

The graph shows the income was below the expenditure. However, the similar direction of the lines suggests that reporting of incomes was generally consistent. The consistency was also suggested by the distance between two lines at different points on the diagonal line. The distance was maintained with a confined range, particularly in the graph of cases in CODs. It is important to note that accuracy levels of income surveyed could change across the cases.



COD (N=156) MOD (N=94)

Figure 6.4 Log total household income and log total household expenditure by district status

6.6 Access to basic infrastructure, durable goods possessions, and housing materials

The households of health workers in CODs were better-off than those in MODs, judging by their access to basic infrastructure and housing materials used for their houses. Health workers' households' access to piped or tapped water was, on average, higher than the access in economic quintiles in the rural area in the Plain and it was higher in CODs than in MODs (Table 6.10). Their access to electricity was only slightly higher in CODs than in MODs. They may have been producing electricity from their own generators.

Table 6.10 Access rates to basic infrastructure of health workers' households in CODs and MODs and access in other divisions (%)

Water piped or tapped			Rural area in plain					
CODs & MODs	CODs	MODs	Average	Poorest	Next Poorest	Middle	Next riches	Richest
7.90	11.50	4.30	3.10	2.00	2.70	1.80	3.80	5.80
			Cambodia					
			10.7					
			Urban in Plain					
			30.8					
			Phnom Penh					
			81.3					
Electricity*			Rural area in plain					
CODs & MODs	CODs	MODs	Average	Poorest	Next Poorest	Middle	Next riches	Richest
98.0	98.1	94.7	49.8	29.1	40.1	49.8	58.9	72.6
			Cambodia					
			45.5					
			Urban in Plain					
			84.8					
			Phnom Penh					
			45.5					
Electricity* generated by batteries or generator or power plants								

Source: Data of ecological and agricultural divisions was generated from CSES 2004 presented by World Bank report, Table 5.2, P.77 and Table 5.3, P.78 (World Bank 2007).

Between CODs and MODs, differentiating the economic statuses of health workers' households through the possession of durable goods (Table 6.11) was inconclusive, though most of the possession rates in CODs were higher than in MODs (Table 6.11). Of 7 items, the differences in possession of electric fans and bicycles were statistically significant ($P < 0.05$, two-tailed)[18] (Table 6.11). In total 17 items were asked about; ten were excluded from the comparison between CODs and MODs, either because the higher possession rate in CODs or MODs was less than 10% or because the goods were not asked about by CSES 2004 (MOP 2006) (Appendix 16).

Table 6.11: Possession rates of nine durable goods in health worker' households in CODs and in MODs and the national average of CSES 2004 (%)

	Electric fan*	**Bicycle***	**Radio**	**TV**
CODs	57.7	80.1	67.3	94.2
MODs	30.9	92.6	71.3	90.4
National average	12.4	64.1	51.8	46.1
	Mobile telephone	**Motorbike**	**Sewing machine**	
CODs	92.3	88.5	11.5	
MODs	87.2	86.2	11.7	
National average	12.9	28.6	6.0	

Note: * indicates the data sets of the goods were different with statistical significance[19].
Source: The national average was from CSES 2004 presented by MOP report (MOP 2006)

[18] Mann-Whitnny U test
[19] Mann-Whitnny U test

The households of health workers used more expensive materials than the average rural[20] household in Cambodia presented in a report of CSES 2004 by MOP (MOP 2005). In CODs, the households used more costly materials in house construction and as fuel for cooking than in MODs (Table 6.12). Differences in materials and of fuels were statistically significant between CODs and MODs (material for frames: P = 0.033 < 0.05, 2-tailed; material for flooring : P=0.000 < 0.05; fuel for cooking: P=0.000 < 0.05. all two-tailed) (Table 6.12).

[20] Definitions of *urban* and *rural* were not seen in the report.

Table 6.12: Rates of materials used for housing in CODs and in MODs (%)

Frame							
	High quality wood	**Concrete**	**Low quality wood**	**Others**	**Total**		
CODs	69.9	20.5	6.4	3.2	100		
MODs	83	9.6	7.4	0	100		
Flooring							
	Parquet Wood	**Bamboo, palm**	**Tile**	**Cement**	**Others**	**Wood board**	**Total**
CODs	37.8	32.7	18.6	4.5	6.4	0.0	100
MODs	29.8	53.2	3.2	3.2	9.6	1.1	100
Roof							
	Tile	**Glavanised iron**	**Fibre cement**	**Concrete**	**Thatch leaf**	**Others**	**Total**
CODs	57.1	28.8	5.8	5.8	0.6	1.9	100
MODs	73.4	13.8	7.4	1.1	3.2	1.1	100
Fuel for cooking							
	Wood	**Gas**	**Charcoal**	**Others**	**Total**		
CODs	60.3	29.5	9.6	0.6	100		
MODs	74.5	8.5	17.0	0.0	100		

6.7 Conclusion on expenditures

Expenditures in health workers' households in CODs suggested their higher economic status than those in MODs, which was seen in different categories of the expenditures. The proportion of food expenditure to the total household expenditure and the higher mean

educational expenditure in CODs than in MODs supported the higher economic status. Sub-categories in the food expenditure and the educational expenditure also suggested the status. The access levels to the basic infrastructure and the materials used for housing in CODs also supported the higher economic status than those in MODs. Accuracy of the income of the health workers and their households surveyed was supported by the result of the expenditure surveyed. The health workers' households in both CODs and MODs held high economic status in Cambodia.

6.8 Conclusion

This chapter presents the results of empirical investigation about the differences between CODs and MODs in incomes and expenditures of the health workers and their households and the differences in their households' access to basic infrastructures, durable goods possessions and materials used for their housing. These differences suggested that the economic status of households in CODs was higher than in the MODs, though the difference in durable goods possessions showed inconclusive difference. The higher economic status of COD housesholds seemed to result from the payments associated with the contracting settings through raising health workers' incomes, because these payments made up the highest proportion in the total household income in CODs.

Chapter 7 Result of regression analyses

7.1 Introduction

This chapter presents the findings of the investigation of the second research question of this study which is: What is the importance of performance-based payments (the payments associated with the contracting settings) to the income of health workers? The descriptive statistical analyses in Chapter 6 illustrated the higher incomes and overall household income of health workers in CODs compared with those in MODs. The analysis also demonstrated that the payments associated with the contracting settings were responsible for pushing up the incomes of government sector health workers. The health workers' household had different sources of income. Most notably, private practice was lower in CODs than in MODs.

Based on the findings in Chapter 6 and additional descriptive statistical analysis below, multivariate regression analyses of the models described in Chapter 4 were conducted in order to confirm the hypothesis that the impact of the performance-based payments resulted in higher income for the health workers and their households in CODs.

7.2 Additional descriptive statistical analyses

Additional descriptive statistical analysis of the collected cases were conducted (Table 7-1-1 to 7-1-4). The mean, median, and the standard deviation of the dependent variables in the form of the natural logrithms were also presented (Table 7-3-1 and 7-3-2). In these tables, as noted in the bottom of Table 7-1-4, if the number of cases were small - less than two (e.g. two nurses) - data of the cases were not publicized in order to avoid specification about who received how much, in consideration of the agreed anonymity and confidentiality of respondents' to the cases.

Table 7-1-1: Health workers subcategory income, income, total household income by district status, cadre, district, gender (Mean, standard deviation, Median, US$)

	Income from health work excluding private practice			Private practice			Income form health work including private practice			Income form sources other than health work		
	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D.
All (N=250)	1,314.8	1,160.5	763.1	643.6	643.6	1,868.4	1,958.4	1,446.5	1,995.5	874.34	150.0	3161.8
CODs(N=156)	1,653.3	1,509.8	762.4	292.1	0.0	971.3	1,945.3	1,629.8	1,293.9	900.0	236.3	3179.3
MODs (N=94)	753.2	670.5	281.9	1,227.0	450.0	2,731.5	1,980.1	1,098.6	2,805.4	831.1	96.0	3149.1
Male (N=159)	1,384.1	1,185.0	800.9	717.4	0.0	1,533.3	2,101.5	1,626.0	1,706.7	1,153.5	175.0	3899.3
Famale (N=91)	1,193.9	1,160.0	679.6	514.6	0.0	2,398.0	1,708.5	1,235.0	2,409.1	386.3	100.0	766.2
Prim. NS (N=117)	1,239.0	1,071.0	779.1	778.6	0.0	2,376.7	2,017.7	1,361.5	2,443.7	915.44	153.8	3784.5
Secnd. NS (N=64)	1,562.2	1,446.5	724.6	727.3	0.0	1,445.4	2,289.5	1,810.0	1,550.1	1,314.5	235.0	3498.1
Prim. MW (N=43)	1,018.7	906.4	503.6	73.5	0.0	145.0	1,092.2	997.5	454.7	371.9	125.0	661.0
Secnd. MW (N=18)	1,506.9	1,540.8	772.0	511.1	292.5	806.9	2,018.0	1,612.5	1,094.4	404.2	366.3	428.1
Assi. Doc. (N=5)												
Doc (N=3)												
CODs												
Prim. NS(N=62)	1,666.3	1,415.0	826.9	238.6	0.0	1,025.4	1,904.9	1,541.3	1,423.0	1,159.3	201.3	4653.7
Secnd. NS (N=47)	1,798.9	1,635.0	692.4	503.8	0.0	1,193.5	2,302.7	2,005.0	1,355.7	1,038.1	400.0	2140.8
Prim. MW (N=29)	1,239.5	1,185.0	453.7	10.7	0.0	35.4	1,250.2	1,185.0	455.6	444.2	60.0	752.2
Secnd. MW (N=13)	1,843.4	1,670.0	633.5	521.4	0.0	950.2	2,364.9	1,928.0	1,102.1	432.9	500.0	424.5
Assi. Doc(N=4)												
Doc (N=1)												
MOD												
Prim. NS(N=55)	757.3	640.0	292.2	1,387.4	450.0	3,199.1	2,144.7	1,206.0	3,241.8	640.5	110.0	2481.4
Secnd. NS (N=17)	907.5	825.6	262.1	1,345.3	600.0	1,891.7	2,252.8	1,530.0	2,043.3	2,078.7	87.5	5844.7
Prim. MW (N=14	561.1	500.9	204.2	203.7	170.0	195.3	764.8	781.3	223.2	222.3	137.5	396.5
Secnd. MW (N=5)	632.1	627.0	67.6	484.2	450.0	450.0	1,116.3	1,077.0	197.9	329.7	0.0	0.0
Assi.Doc (N=1)												
Doc (N=2)												
Peareang (N=64)	1,718.6	1,557.5	946.0	155.4	0.0	908.1	1,874.0	1,572.9	1,268.3	1274.541	330.313	4681.5
Preah Sdach (N=24)	1,857.6	1,732.0	856.5	69.5	0.0	283.4	1,927.1	1,732.0	979.5	620.958	195	1426.0
Krivong (N=68)	1,519.7	1,394.9	462.8	499.2	0.0	1,140.3	2,018.9	1,504.3	1,421.5	645.967	1,394.9	462.8
Kamchay Mea (N=52)	752.5	652.3	249.8	1,386.7	415.0	3,331.1	2,139.2	1,052.5	3,382.8	908.0	67.5	3423.8
Mesang (N=42)	754.0	686.0	320.4	1,029.3	475.0	1,746.0	1,783.2	1,147.9	1,883.0	736.72	151.25	2809.8

Table 7-1-2: Health workers subcategory income, income, total household income by district status, cadre, district, gender (Mean, standard deviation, Median,

	Total household income			Total household expenditure		
	Mean	Median	S. D. *	Mean	Median	S. D. *
All (N=250)	2,832.8	1,735.5	3,849.5	3,595.8	3,097.3	1,808.9
CODs(N=156)	2,845.3	1,869.4	3,499.8	3,801.7	3,275.6	1,822.0
MODs (N=94)	2,811.9	1,373.0	4,388.8	3,254.1	2,706.6	1,743.3
Male (N=159)	3,255.0	1,916.5	4,377.0	3,789.9	3,263.9	1,752.4
Famale (N=91)	2,095.0	1,515.4	2,549.4	3,256.5	2,892.9	1,865.1
Prim. NS (N=117)	2,933.1	1,724.0	4,461.9	3,562.4	3,162.2	1,703.9
Secnd. NS (N=64)	3,604.0	2,531.8	4,132.3	3,943.8	3,288.1	1,781.2
Prim. MW (N=43)	1,464.1	1,274.2	829.4	3,293.6	2,908.2	1,400.8
Secnd. MW (N=18)	2,422.3	1,842.3	1,303.0	3,464.3	2,823.5	2,840.6
Assi. DocDoc (N=8)						
Doc (N=3)						
CODs						
Prim. NS(N=62)	3,064.2	1,819.6	1,819.6	3,800.0	3,479.3	1,663.8
Secnd. NS (N=47)	3,340.9	2,536.5	2,690.1	4,056.4	3,510.8	1,814.7
Prim. MW (N=29)	1,694.4	1,493.5	880.1	3,590.4	3,263.8	1,339.5
Secnd. MW (N=13)	2,797.8	367.9	1,326.5	3,987.9	2,910.2	3,195.3
Assi. Doc (N=4)						
Doc (N=1)						
MOD						
Prim. NS(N=55)	2,785.3	1,520.7	3,974.5	3,294.6	3,033.2	1,723.9
Secnd. NS (N=17)	4,331.5	1,670.0	6,757.5	3,632.8	2,998.7	1,698.5
Prim. MW (N=14	987.1	916.8	436.6	2,679.1	2,304.8	1,368.2
Secnd. MW (N=5)	1,446.0	1,411.0	535.5	2,102.8	1,662.3	674.7
Assi.Doc.(N=1)						
Doc (N=2)						
Peareang (N=64)	3,148.5	1,860.3	4,930.5	3,874.1	3,263.2	1,854.6
Preah Sdach (N=24)	2,548.1	1,859.9	1,761.9	3,991.2	3,058.2	2,626.3
Krivong (N=68)	2,664.9	1,889.9	2,063.9	3,655.4	3,344.4	1,412.0
Kamchay Mea (N=52)	3,047.7	1,298.3	5,127.4	3,360.3	2,706.6	1,972.7
Mesang (N=42)	2,519.9	1,593.0	3,290.7	3,123.0	2,685.8	1,439.1

Table 7-1-3: Health workers subcategory income, income, total household income by district status, cadre, district, gender (Mean, standard deviation, Median, US$)

	Income from health work excluding PP			Private practice			Income form health work including private practice			Income form sources other than health work		
	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D. *
Peareang (64)												
Prim. NS(N=25)	1,695.68	1,541.10	945.83	-	-	-	1,695.68	1,541.10	945.83	2006.56	250.00	7170.2
Secnd. NS (N=20)	1,838.77	1,545.00	924.31	495.37	-	1,599.25	2,334.14	1,726.05	1,709.66	1128.46	507.50	2447.9
Prim. MW (N=13)	1,317.35	1,185.00	595.10	3.00	3.00	N/A	1,320.35	1,185.00	592.09	634.91	600.00	596.1
Secnd. MW (N=3)	2,321.00	1,928.00	1,020.90	-	-	-	2,321.00	1,928.00	1,020.90	77.50	0.00	134.2
Assi. Doc. (N=2)												
Doc (N=1)												
Preah Sdach (24)	Mean	Median	S. D. *									
Prim. NS(N=16)	1,855.53	1,732.00	926.50	18.75	-	75.00	1,874.28	1,732.00	918.28	668.31	135.00	1592.6
Secnd. NS (N=5)	2,099.40	2,150.00	757.11	273.75	273.75	N/A	2,373.15	2,150.00	1,302.96	873.50	400.00	1288.3
Prim. MW (N=1)												
Secnd. MW (N=1)												
Assi. Doc (N=1)												
Krivong (N=68)	Mean	Median	S. D. *		64.00					663.24	100.00	1349.0
Prim. NS(N=21)	1,487.11	1,296.00	552.20	690.24	-	1,696.72	2,177.35	1,407.00	2,082.57	586.02	250.00	919.1
Secnd. NS (N=22)	1,694.44	1,649.00	365.63	563.75	225.00	847.65	2,258.19	2,015.00	1,026.69	1041.22	0.00	2038.8
Prim. MW (N=15)	1,208.24	1,193.80	283.80	18.00	-	47.84	1,226.24	1,290.00	295.98	299.47	0.00	873.9
Secnd. MW (N=9)	1,703.50	1,550.00	1,550.00	753.19	375.00	1,076.12	2,456.69	2,357.50	1,220.94	599.44	560.00	404.7
Assi. Doc.(N=1)												
Doc (N=0)												
Kamchay Mea (N=52)				-	-	-						
Prim. NS(N=29)	695.60	620.00	218.14	1,423.86	450.00	3,966.38	2,119.47	1,080.00	3,965.55	388.46	60.00	644.8
Secnd. NS (N=13)	926.98	846.60	287.69	1,389.96	600.00	2,121.46	2,316.94	1,305.00	2,304.29	2539.77	87.50	6644.8
Prim. MW (N=4)	599.75	560.50	158.55	84.50	-	169.00	684.25	678.50	143.64	446.25	127.50	726.3
Secnd. MW (N=3)	603.17	609.00	60.46	507.00	440.00	335.55	1,110.17	1,049.00	275.39	0.00	0.00	0.0
Ass Doc (1)												
Doc (N=2)												
Mesang (N=42)												
Prim. NS(N=26)	826.21	783.25	349.04	1,346.73	700.00	2,117.18	2,172.94	1,508.35	2,255.21	984.04	167.50	3539.6
Secnd. NS (N=4)	844.38	774.50	168.61	1,200.00	800.00	500.00a	2,044.38	1,664.25	975.34	643.75	37.50	1238.0
Prim. MW (N=10)	545.67	475.75	225.63	251.35	275.00	300.00	797.02	803.50	247.12	139.50	137.50	132.3
Secnd. MW (N=2)												
Assi.Doc.(N=0)												
Doc (N=0)												

Table 7-1-4: Health workers subcategory income, income, total household income by district status, cadre, district, gender (Mean, standard deviation, Median, US$)

	Total HH income			Total HH Expenditure		
	Mean	Median	S. D. *	Mean	Median	S. D. *
Peareang (64)						
Prim. NS(N=25)	3,702.23	1,686.00	7,266.33	4,135.63	3,689.69	2,172.33
Secnd. NS (N=20)	3,462.60	2,578.63	3,326.39	4,076.88	4,239.85	1,860.15
Prim. MW (N=13)	1,955.25	1,693.25	768.67	3,619.04	2,985.11	1,535.42
Secnd. MW (N=3)	2,398.50	1,928.00	1153.10	2,910.61	2,647.88	807.05
Assi. Doc. (N=2)						
Doc (N=1)						
Preah Sdach (24)						
Prim. NS(N=16)	2,542.59	1,859.93	1,847.91	3,709.25	3,641.77	1,460.24
Secnd. NS (N=5)	3,246.65	2,550.00	1,781.65	3,568.77	2,879.08	1,787.00
Prim. MW (N=1)	847.50	847.50		2,200.47	2,200.47	N/A
Secnd. MW (N=1)						
Assi. Doc (N=1)						
Doc (N=0)						
Krivong (N=68)						
Prim. NS(N=21)	2,763.38	1,916.50	2,417.64	3,469.70	3,287.27	958.70
Secnd. NS (N=22)	3,299.40	2,615.78	2,258.76	4,148.49	3,473.04	1,846.21
Prim. MW (N=15)	1,525.71	1,320.00	947.17	3,658.06	3,700.13	1,193.44
Secnd. MW (N=9)	3,056.14	3,010.00	1,418.89	3,207.42	2,910.23	938.77
Assi. Doc.(N=1)						
Doc (N=0)						
Kamchay Mea (N=52)						
Prim. NS(N=29)	2,507.93	1,296.50	3,990.84	3,261.60	3,033.23	1,956.52
Secnd. NS (N=13)	4,856.71	1,617.50	7,684.24	3,862.54	3,175.82	1,858.47
Prim. MW (N=4)	1,130.50	935.50	662.18	2,256.15	2,354.90	207.66
Secnd. MW (N=3)	1,110.17	1,049.00	275.39	2,002.48	1,662.33	618.61
Ass Doc (1)						
Doc (N=2)						
Mesang (N=42)						
Prim. NS(N=26)	3,156.98	1,841.50	3,998.69	3,331.37	3,027.66	1,459.27
Secnd. NS (N=4)	2,688.13	2,579.50	1,394.04	2,885.93	2,727.75	773.17
Prim. MW (N=10)	936.52	916.75	332.31	2,848.22	2,185.04	1,605.75
Secnd. MW (N=2)						
Assi.Doc., Doc (N=0)						
Doc (N=0)						

Note for Table 7-1-1 to 7-1-4 :if the number of cases were small, - less than two (e.g. two nurses) - data of the cases were not publicized, in order to avoid specification about who received how much, in consideration to anonimityand confidentiality for the respondents' to the cases.

(1) Structure of number of health workers

The structure of collected data employing a complete enumeration approach appeared largely to reflect the actual structure of numbers of cadres in rural Cambodia (MOH 2002). The structure, which has been discussed in Chapter 6, is outlined here because understanding the structure seemed to underpin the discussion and interpretation of the regression results. Nearly half of the cases were those of nurses; with higher numbers in the lower (primary) than the higher level (secondary). Doctors, assistant doctors and secondary midwives were minorities. The number of doctors and assistant doctors is less than 10 and that of midwives was less than 20. In some districts no assistant doctors or no doctors or no secondary midwives were included. No females were included in the assistant doctors and doctor and no males within the midwives, which reflected the gender influence on entry to these cadres. Males were also in the majority in secondary nurses (Table 6.1).

Both in CODs and MODs, nurses were the largest group; around 70% in CODs and 80% in MODs. In terms of the nurses, primary nurses formed the largest number. The primary nurses in MODs reached around 60% of the total number. The number of secondary nurses has a disparity between CODs and MODs.

(2) Dependent variables.

The dependent variables were tabulated by district, by cadre and district, and by cadre, reflecting the interests of this study which centered on the differences between CODs and MODs (Table 7-1-1 to 7-1-4, Table 7-3-1 and 7-3-2).

1) Income from health work excluding private practice

Income from health work excluding private practice is one of the core interests of this study. At the individual Operational District level, in the three CODs the mean of this category of

income was at least double in the two MODs (Table 7-1-1).

By Operational District

The means of income from health work excluding private practice in Preah Sdach, Peareang and Kirivong Operational District, the three CODs, were higher than the means in Kamchay Mea and Mesang Operational District, the two MODs. The highest mean in Preah Sdach Operational was almost 2.5 times higher than the mean in Kamchay Mea and Mesang Operational District (Table 7-1-1).

By cadre and district status

The means of this income in the four major cadres (primary and secondary nurses, primary and secondary midwives) in COD were higher than in MODs. The means in CODs were at least double the means in the same cadre in MODs. The mean in secondary midwives in CODs was nearly triple (Table 7-1-1 to 7-1-4).

2) Income from private practice

By district

The levels of income from dual practice differed markedly between the three CODs and two MODs. The mean private practice income was much lower in the three CODs than in the two MODs. The lowest mean in CODs, held by Preah Sdach Operational District, was almost one twentieth of the highest mean in MODs, held by Kamchay Mea Operational District (Table 7-1-1). This supports this study's hypotheses about the changes in incomes brought to CODs by the contracting incentives. It also suggests that proportional changes to the total household income occurred in the government sector income and private sector income. The

private practice income in CODs seemed to be reduced by the increases in the income in the government sector, which seemed to have accompanied transfers of labour supply between the two sectors.

Concerning the level of prohibition of dual practice, among the three CODs, the Preah Sdach's lowest mean appeared to contradict the expected outcome from the level. The level in Preah Sdach Operational District was the weakest of the three and was the same as the MOH personal rule (Chapter 5). Therefore, the highest mean in CODs might be expected in Preah Sdach. The level in Peareang Operational District was also inconsistent with the expected outcome, resulting the middle level private practice income (Table 7-1-1).

By cadre and district status

The means private practice income in three of the four cadres in CODs were lower, compared with the means in the same cadres in MODs. An exception was the secondary midwives' mean which was higher in CODs than in MODs, by around 10%. However, cautious treatment to this is necessary, since even the total number of secondary midwives in CODs and MODs was small (N = 18). In midwives in MODs, their means of private practice were noticeably lower than in the nurses in MODs, being only around one sixth to one third (Table 7-1-1).

Within each type of district (CODs and MODs), the mean private practice income by cadre varied largely. In MODs where no changes in prohibition rules were brought about, if the private practice income of nurses and midwives were compared, the difference appeared to be large. In cases in CODs, decisions of whether to participate in dual practice may be

influenced by the contracting settings. Therefore, the reported private practice income might have variations due to this special setting.

At the Operational District level, the percentage of the number of cases which reported private practice income to the total number of health workers was higher in the two MODs than those in the three CODs. In Kirivong District, 44.1% of health workers conducted dual practice and this was the highest percentage among the three CODs, followed by the percentages in Peareang, then by Preach Sdach Operational District (Table 7.2). These percentages in CODs seemed to be inconsistent with the levels of prohibition of dual practice, similar to the inconsistency between the mean. However, cautious treatment of these findings is necessary, since the percentage may not necessarily agree with the mean private practice income by Operational District (Table 7-1-3, 7-1-4).

3) Income from health work including private practice

By Operational District

Among the five Operational Districts, the rank of the mean income from health work including private practice appeared to be framed incompletely by their status: a COD or an MOD. In Kamchay Mea Operational District the mean was highest followed by Kirivong Operational District. Preah Sdach, Peareang and Mesang Operational District followed. The higher means in Kamchay Mea were realized by the private practice income, since the mean income from health work excluding private practice, the subcategory income, in Kamchay Mea was the fourth highest among the five Operational Districts. This suggests high magnitude to, as well as a high proportion of, the private practice income in the current subcategory income: income from health work including private practice (Table 7-1-1).

Table 7.2: Percentage of number of reported cases obtained private practice income

	Conducted	% *	Not Conducted	%*	Total
Operational District					
Peareang (COD)	4	6.2	60	93.8	64
Prea Sdach (COD)	2	8.3	22	91.7	24
Kirivong (COD)	30	44.1	38	55.9	68
Kamchay Mea (MOD)	32	61.5	20	38.5	52
Mesang (MOD)	38	90.5	4	9.5	42
OD status					
COD	36	22.4	120	76.9	156
MOD	70	70.2	24	25.5	94
	106		144		

%* to the total number

By cadre

The mean of this subcategory income by cadre demonstrated different orders between CODs and MODs. The mean in primary nurses in CODs was higher than in MODs; however, the mean in secondary nurses was lower. The means in both primary and second midwives were higher in CODs than in MODs (Table 7-1-1). The means of three cadres: primary and secondary nurses and secondary midwives were relatively closer; however, the mean of primary midwives was lower, around half of the means of the three cadres (Table 7-1-1).

By cadre and district status

In CODs, the mean of this income appeared to show smaller income differences between nurses and midwives, compared with that in MODs (Table 7-1-1).

Differences in the means between nurses and midwives in MODs were larger, compared with difference in the means between nurses and midwives in CODs. In MODs, the mean in nurses was more than double the mean in midwives. The means in primary and second

midwives are the lowest and second lowest among eight groups (the four majority carders in CODs and in MODs).

In MODs, nurses' higher means of this subcategory income (the income from health work including private practice) than midwives seemed to be an outcome of their higher mean private practice income than midwives'. The larger disparity in MODs, i.e., less disparity in CODs, may indicate that the payments associated with the contracting settings might have reduced the income disparity between nurses and midwives (Table 7-1-1).

4) Total household income

By Operational District

The means total household income in Peareang Operational District was the highest followed by Kamchay Mea Operational District with a difference of less than 5% compared with the higher mean of Peareng's. The means in Preah Sdach, Kirivong, and Mesang Operational District were closer (Table 7-1-2).

By cadre and district status

The mean total household income of secondary nurses in CODs was lower than in MODs due to higher income from sources other than health work in MODs compared with CODs (Table 7-1-2). However, the mean total household income of the other three of the four majority cadres in CODs was higher than in MODs.

5) Total household expenditure

By Operational District

The rank of the means in total household expenditure among five districts strongly indicated

the higher economic status of CODs compared with MODs, which seemed to be associated with the contracting payments. From the highest, the rank follows as Preah Sdach, Peareang, and Kirivong Operational District: the three CODs, followed by Kamchay Mea and Mesang Operational District (Table 7-1-2).

By cadre

The means total household expenditure of nurses was higher than that of midwives. Between secondary and primary nurses, the secondary level workers' mean expenditure was higher than that of primary level workers'. The same outcome occurred with the midwives (Table 7-1-2).

By cadre and district status

The means in all four majority cadres were higher in CODs than in MODs. Compared with the mean expenditure difference in nurses between CODs and MODs, the differences in midwives between CODs and MODs were larger. The difference in secondary midwives was particularly noticeable; the mean in secondary midwives in CODs was higher, being close to double that of the mean in secondary midwives in MODs (Table 7-1-2).

Difference in the means between nurses and midwives in MODs was larger, compared with difference in the means between nurses and midwives in CODs. The means in primary and secondary midwives are the lowest and second lowest among the eight groups (the four majority carders each in CODs and in MODs) in MODs and CODs.

(3) Conclusion of additional descriptive statistical analyses

This additional descriptive statistical analysis showed that the incomes and the total household expenditure were nearly all higher in cases in CODs than in MODs. This supports this study's hypotheses that contracting incentives brought about higher incomes in CODs. They were highly likely to be attributable to the payments associated with the contracting settings which became a high proportion of the health workers' income in the government sector as well as of their household incomes in CODs.

It is noted that in the following tables, as noted in the bottom of Table 7-1-4, if the number of cases were small - less than two (e.g. two nurses) - data of the cases was not publicized in order to avoid specification about who received how much income, and in consideration for the anonymity and confidentiality agreed with the respondents' to the cases.

Table 7-3-1: Heatlth workers subcategory income, income, total household expediture in the natural logrithms by cader. district, gender (mean, standard deviation, median)

	Ln (Income from health work excluding private practice)			LN (Income form health work including private practice)			Ln (Total household income)			LN (Total household expenditure)		
	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D. *
All (N=250)	7.037	7.057	0.534	7.334	7.277	0.638	7.584	7.459	0.756	8.078	8.038	0.466
CODs(N=156)	7.322	7.320	0.414	7.427	7.396	0.515	7.689	7.533	0.634	8.143	8.094	0.449
MODs (N=94)	6.565	6.508	0.340	7.179	7.002	0.782	7.409	7.225	0.902	7.969	7.904	0.476
Male (N=159)	7.095	7.078	0.517	7.430	7.394	0.633	7.707	7.558	0.786	8.137	8.091	0.460
Famale (N=91)	6.936	7.056	0.550	7.166	7.119	0.616	7.369	7.323	0.653	7.973	7.970	0.461
Prim. NS (N=117)	6.968	6.976	0.543	7.317	7.216	0.674	7.563	7.452	0.798	8.072	8.059	0.465
Secnd. NS (N=64)	7.260	7.277	0.434	7.567	7.501	0.564	7.871	7.837	0.729	8.179	8.098	0.458
Prim. MS (N=43)	6.808	6.810	0.498	6.917	6.905	0.401	7.162	7.150	0.497	8.020	7.975	0.399
Secnd. MW (N=18)	7.186	7.340	0.545	7.493	7.385	0.482	7.667	7.518	0.511	7.990	7.945	0.505
Assi. DocDoc (N=5)												
Doc (N=3)												
CODs												
Prim. NS(N=62)	7.323	7.255	0.428	7.398	7.340	0.514	7.673	7.506	0.688	8.155	8.154	0.420
Secnd. NS (N=47)	7.433	7.399	0.346	7.618	7.603	0.481	7.912	7.839	0.591	8.204	8.164	0.475
Prim. MS (N=29)	7.061	7.078	0.359	7.069	7.078	0.360	7.331	7.309	0.446	8.119	8.091	0.374
Secnd. MW (N=13)	7.471	7.421	0.316	7.680	7.564	0.427	7.839	7.790	0.456	8.136	7.976	0.497
Assi. Doc(N=4)												
Doc (N=1)												
MOD												
Prim. NS(N=55)	6.568	6.462	0.344	7.225	7.095	0.813	7.439	7.327	0.897	7.977	8.017	0.498
Secnd. NS (N=17)	6.779	6.716	0.249	7.428	7.333	0.748	7.756	7.421	1.036	8.111	8.006	0.414
Prim. MS (N=14	6.284	6.215	0.294	6.601	6.661	0.286	6.812	6.820	0.418	7.814	7.743	0.379
Secnd. MW (N=5)	6.444	6.441	0.108	7.005	6.982	0.176	7.221	7.252	0.375	7.612	7.416	0.310
Assi.Doc (N=1)												
Doc (N=2)												
Peareang (64)	7.316	7.351	0.519	7.367	7.361	0.569	7.697	7.529	0.696	8.154	8.101	0.479
Preah Sdach (24)	7.445	7.457	0.404	7.468	7.457	0.430	7.670	7.527	0.573	8.158	8.026	0.484
Krivong (N=68)	7.285	7.241	0.283	7.468	7.316	0.489	7.687	7.544	0.600	8.127	8.115	0.413
Kamchay Mea (N=52)	6.575	6.480	0.309	7.169	6.959	0.853	7.399	7.169	0.967	7.982	7.904	0.513
Mesang (N=42)	6.551	6.531	0.378	7.192	7.045	0.693	7.422	7.373	0.826	7.954	7.939	0.432

Table 7-3-2: Heatlth workers subcategory income, income, total household expediture in the natural logrithms by cader. district, gender (mean, standard deviation, median)

	Ln (Income from health work excluding private practice)			LN (Income form health work including private practice)			Ln (Total household income)			LN (Total household expenditure)		
	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D. *	Mean	Median	S. D. *
Peareang (64)												
Prim. NS(N=25)	7.299	7.340	0.536	7.299	7.340	0.536	7.670	7.430	0.821	8.192	8.213	0.541
Secnd. NS (N=20)	7.416	7.343	0.446	7.579	7.453	0.572	7.890	7.783	0.646	8.202	8.352	0.504
Prim. MS (N=13)	7.089	7.078	0.459	7.093	7.078	0.455	7.503	7.434	0.409	8.117	8.001	0.403
Secnd. MW (N=3)	7.689	7.564	0.417	7.689	7.564	0.417	7.711	7.564	0.453	7.952	7.882	0.267
Assi. Doc. (N=2)												
Doc (N=1)												
Preah Sdach (24)												
Prim. NS(N=16)	7.445	7.457	0.387	7.458	7.457	0.382	7.648	7.527	0.574	8.147	8.200	0.391
Secnd. NS (N=5)	7.595	7.673	0.373	7.667	7.673	0.499	7.961	7.844	0.560	8.104	7.965	0.404
Prim. MS (N=1)												
Secnd. MW (N=1)												
Assi. Doc (N=1)												
Krivong (N=68)												
Prim. NS(N=21)	7.258	7.167	0.290	7.470	7.249	0.575	7.694	7.558	0.621	8.118	8.098	0.263
Secnd. NS (N=22)	7.412	7.408	0.221	7.641	7.608	0.400	7.922	7.869	0.570	8.228	8.153	0.480
Prim. MW (N=15)	7.071	7.085	0.241	7.084	7.162	0.249	7.221	7.185	0.434	8.149	8.216	0.357
Secnd. MW (N=9)	7.404	7.346	0.288	7.706	7.765	0.469	7.928	8.010	0.472	8.039	7.976	0.272
Assi. Doc.(N=1)												
Doc (N=0)												
Kamchay Mea (N=52)												
Prim. NS(N=29)	6.500	6.430	0.300	7.102	6.985	0.863	7.294	7.075	0.882	7.942	8.017	0.542
Secnd. NS (N=13)	6.795	6.741	0.270	7.390	7.174	0.835	7.747	7.389	1.161	8.163	8.063	0.446
Prim. MS (N=4)	6.372	6.329	0.250	6.512	6.506	0.212	6.883	6.838	0.589	7.718	7.764	0.097
Secnd. MW (N=3)	6.399	6.412	0.101	6.992	6.956	0.244	6.988	6.956	0.249	7.573	7.416	0.290
Ass Doc (1)												
Doc (N=2)												
Mesang (N=42)												
Prim. NS(N=26)	6.644	6.664	0.379	7.362	7.314	0.746	7.600	7.518	0.902	8.017	8.015	0.452
Secnd. NS (N=4)	6.725	6.652	0.185	7.551	7.416	0.416	7.786	7.789	0.553	7.942	7.908	0.259
Prim. MS (N=10)	6.249	6.165	0.315	6.637	6.688	0.314	6.784	6.820	0.365	7.852	7.689	0.445
Secnd. MW (N=2)												
Assi.Doc. (N=0)												
Doc (N=0)												

7.3 Regression results

The main interest of analyses was whether the variable COD was related to higher income in CODs than in MOD with statistical significance. The main interest of the analysis was also whether the variable Peareang, Preah Sdach and Kirivong, the variable for the three CODs, was related to higher income than the reference variable Kamchay Mea, an MOD. The main interest framed descriptions of the results of regression analyses.

Regressions of the incomes were performed in cases of all health workers (N=250) and cases by cadre. The regressions of cases by cadre were intended to confirm the magnitude of district status as CODs on the incomes, i.e., the impact of contracting payments. The cases consisted of three groups: primary nurses, secondary nurses, and midwives. Due to the small number of cases of primary and the secondary midwives, these two groups were combined. However, means of subcategory incomes (income from health work excluding private practice, income from health work excluding private practice, private practice income) and the total household income differed between the two groups of midwives (Table 7-1-1to 7-1-4). The regressions of the total household expenditure were conducted in all cases.

The dependent variables for regressions were transformed to the natural logarithm as described in Chapter 4 and further confirmed the normality, prior to the regression analyses. Plotting of dependent variable values, after the log-natural transformed into the log-natural form, relative to the predicted values was drawn (the normal P-P plot). The dependent variables are income from health work excluding private practice, income from health work including private practice, total household income, and total household expenditure (Figure 7. 1 to 7.4)

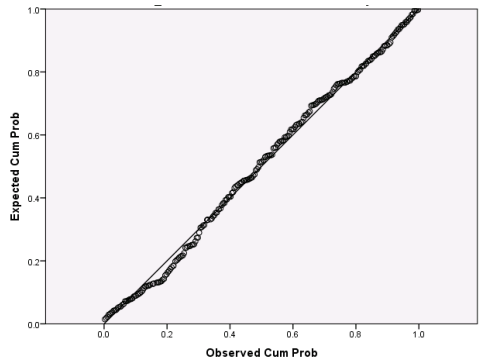


Figure7.1 Normal P-P plot Ln (income from health work excluding private practice)

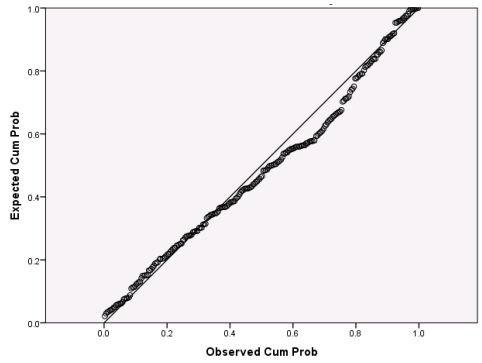


Figure7.2. Normal P-P plot Ln (income from health work including private practice)

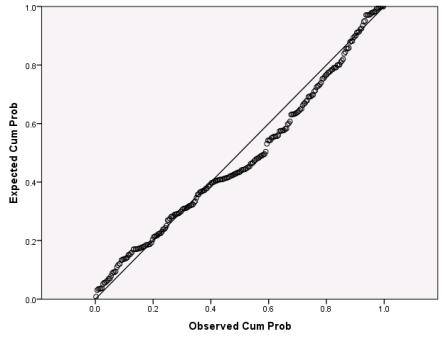


Figure7.3: Normal P-P plot Ln (Total household income)

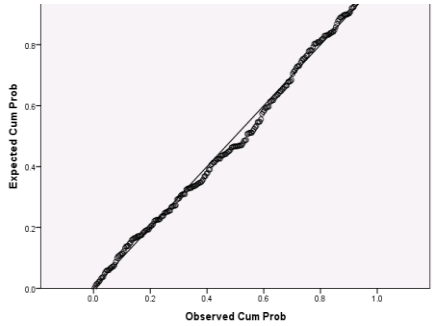


Figure7.4. Normal P-P plot Ln(Total household expenditure)

After regressions were conducted, only those models which were of statistical significance (F-value) were checked and tested about their cook's distance as well as heteroscedascity by plotting of the residuals[21] and the modified White test. results from the regressions which were not statistically significant were shown only in tables. If noticeable points were found in the result, they are described.

[21] Given limited number of the total cases collected by the survey of this study, in order to ensure sufficient number of cases for regressions in different groups of cases (a group of all health worker cases and groups of cases by cadre), outlier-cases were not excluded or trimmed. As a result, the plotting included these cases.

7.3.1 Income from health work excluding private practice

The core hypotheses concerning the income from health work, excluding private practice, was that the payments associated with the contracting projects were likely to have contributed a high proportion of health worker income. Other hypotheses of independent variables for regressions of this income have been primarily written about in Chapter 4 (4.3.3 (8) c). Hypotheses not included in Chapter 4 are as follows. The intensity of the prohibition of dual practice might influence the income from health work, excluding private practice. If the intensity of prohibition of dual practice was high, the health worker might be restrained in their participation, with the possible result that these health workers could make greater efforts within the government sector. As a result, the government sector income, i.e., the income from health work excluding private practice, might have increased in.

The marital status of a male health worker could have an effect on income because of government family allowance payments paid to only married males (Chapter 3).Their amounts and influence on their basic payments seemed to be limited according to government basic payments. They were answered as a part of their regular government payments in this survey.

Prior to multivariate regressions, univariate regressions using the logged income from health work excluding private practice as the dependent variable with each independent variable were undertaken. The regressions tested the R-squares for the variables, other statistics including p-value for the model (Table 7.4) and p-value of the independent variable. In Table 7.4 each row is a model.

Each set of dummy variables for the independent variables were included in a regression model for the test.

The cut-off point for selecting the independent variables was the p-value below 0.2 as noted in Chapter 4 (4.3.3 (8) d) (National Bureau of Statistics, Tanzania and Oxford Policy Management Ltd. U.K. 2001). Following the result presented in Table 7.4, the variable for household size (Household size) was excluded (Table 7.4).

Because of the theoretical importance of the categorical or ordinal variables in the hypothesis, even if some variables in a set of dummy variables exceeded the cut-off point, the categorical or ordinal variable consisted of the dummy variables was not excluded.

Table 7.4: Results of univariate regression of income from health work except private practic

	R	R Square	Adjusted R Square	S.E.	Sig.(model)
Prohibition of Private Practice	0.522	0.272	0.266	0.457	0.000
Cadre	0.305	0.093	0.074	0.514	0.000
Age	0.086	0.007	0.003	0.533	0.173
Age Squ	0.080	0.006	0.002	0.533	0.021
Male	0.144	0.021	0.017	0.530	0.023
COD	0.689	0.474	0.472	0.388	0.000
Household size	0.003	0.000	-0.004	0.535	0.959
5ODs	0.684	0.468	0.459	0.393	0.000
Economic Status	0.284	0.081	0.077	0.513	0.000
Married	0.131	0.017	0.013	0.530	0.038
Age, Age Squ	0.108	0.012	0.004	0.533	0.233

S.E. :Standard Error of the Estimate

Note: Sig = the p-value of the model. *** < 0.01, **< 0.05, * < 0.1.

After the exclusion of Household size, the variable, the three models presented in Chapter 4 were changed as follows.

Group A Model 1 resulted in the following model

$$\text{Ln}(Y_i) = a + b_1 \text{Secondary NS} + b_2 \text{Primary MW} + b_3 \text{Secondary MW} + b_4 \text{Assistant Doctors} + b_5 \text{Doctor} + b_6 \text{Age} + b_7 \text{Age Squared} + b_8 \text{Male} + b_9 \text{Married} + b_{10} \text{COD} + b_{11} \text{Economic Status} + e$$

Group A Model 2 resulted in the following the model

$$\text{Ln}(Y_i) = a + b_1 \text{Secondary NS} + b_2 \text{Primary MW} + b_3 \text{Secondary MW} + b_4 \text{Assistant Doctors} + b_5 \text{Doctor} + b_6 \text{Age} + b_7 \text{Age Squared} + b_8 \text{Male} + b_9 \text{Married} + b_{10} \text{COD} + b_{11} \text{Prohibition dual practice Mid} + b_{12} \text{Prohibition dual practice Low} + e$$

Group B Model 3

$$\text{Ln}(Y_i) = a + b_1 \text{Secondary NS} + b_2 \text{Primary MW} + b_3 \text{Secondary MW} + b_4 \text{Assistant Doctors} + b_5 \text{Doctor} + b_6 \text{Age} + b_7 \text{Age Squared} + b_8 \text{Male} + b_9 \text{Married} + b_{10} \text{Measang} + b_{11} \text{Peareng} + b_{12} \text{Preah Sdach} + b_{13} \text{Kirivong} + e$$

Where Ln(Y_i) means the log-natural transformed (Ln) the income and household expenditure to be investigated (HWIncmExcPP, HWIncmInclPP, Total HH Income, Total HH Expenditure).

These models, when they applied to cases by cadre, did not include Cardre. When the cadre was midwives, the models included neither Cadre nor Male.

(1) Group A Model 1.

1) All health workers

From results noted in Table 7.5, the following was interpreted. The interpretation included exponentiations of coefficients for independent variables applied to the regression of the log-transformed dependent variable (Wooldbridge 2009). The calculation formula was explained in Chapter 4, 4.3.3 (8).

In this model, controlling for all other variables, a health work's (Ln) income from health work excluding private in CODs is on average 78.0% ($p < 0.01$) higher than a comparable health worker's (Ln) income in MODs. After exponetiating the coefficient, the income from health work excluding private practice of a health worker in CODs as was on average 118.1% ($p < 0.01$) above the income of a comparable health worker in MODs. This result, the higher income was consistent with the result of descriptive statistical analyses as noted in Chapter 6 and Table 7-1-1.

The coefficient of the variable for COD was one of only three variables which were statistically significant ($p < 0.05$) in this model.

Controlling for all other variables, a secondary nurse's (Ln) income from health work excluding private practice was on average 13.7% ($p <0.05$) higher than a comparable primary nurse's (Ln) income. The variable for primary nurses was the reference variable. After exponetiating the coefficient, the income from health work excluding private practice of a secondary nurse was on average 14.7% ($p < 0.05$) above the income of a comparable primary nurse's income.

Controlling for all other variables, a primary midwife's (Ln) income from health work excluding private practice was on average 17.6% ($p <0.05$) lower than a comparable primary

nurse's (Ln) income. After exponetiating the coefficient, the income from health work excluding private practice of a primary midwife was on average 14.7% ($p < 0.05$) above the income of a comparable primary nurse's income.

Controlling for all other variables a one-year advance in the age of a health worker increased the (Ln) income by 4.2% ($p > 0.1$), compared with the (Ln) income earned when the health worker was one year younger. After exponetiating the coefficient, a one-year advance in the age of a health worker increased the income by 4.2% ($p > 0.1$), compared with the income earned when the health worker was one year younger. Controlling for all other variables, the (Ln) income of a male health worker was 9.1% ($p > 0.1$) higher than the (Ln) income of a comparable female health worker. After exponetiating the coefficient, the income of a male health worker was on average 9.5 % ($p > 0.1$) above the income of a comparable female health worker's income. Controlling for all other variables, the (Ln) income of a married health worker was 6.8% ($p > 0.1$) higher than the (Ln) income of a comparable unmarried health worker. After exponetiating the coefficient, the income of a married health worker was on average 7.0 % ($p > 0.1$) above the income of a comparable unmarried health worker's income.

Table 7.5: Result of regression of (Ln) income from health work excluding private practice [Model 1] (all health workers, N =250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.137	0.066	2.072	0.039	**	0.639	1.566
Primary MW	-0.176	0.088	-2.009	0.046	**	0.488	2.049
Secondary MW	0.173	0.113	1.533	0.127		0.630	1.587
Assistant Doctor	0.073	0.176	0.417	0.677		0.882	1.133
Doctor	0.197	0.216	0.913	0.362		0.967	1.034
Age	0.042	0.033	1.263	0.208		0.008	123.960
Age Squared	0.000	0.000	-1.292	0.198		0.008	121.753
Male	0.091	0.082	1.118	0.265		0.347	2.881
Married	0.068	0.078	0.875	0.382		0.716	1.397
COD	0.780	0.055	14.120	0.000	***	0.747	1.338
Economic Status*	0.043	0.061	0.705	0.482		0.717	1.394
Constant	5.529	0.699	7.913	0.000			
Prob. >F	0.000						
R-square	0.552						
R-square adjusted	0.531						
Root MSE	0.366						
AIC	-491.390						
*p < 0.1							
**p < 0.05							
***p < 0.01							

Cook's distance: 0.0340 < 0.5

Heterocedasticity in the model was checked by plotting the relation between the standardised residuals and the standardized predicted values concerning the dependent variable (Figure 7.5). The plot shows the heterocedasticity, with two groups of error variance. However, in parallel with the features of hetroscedasticity, the feature of homoscedasticity appeared to be present within each group. In contrast, the result of modified White test indicated homoscedasticity as below.

Considering the modified White test result, i.e., homoscedasticity and the bimodality in the plots, further tests of the bimodality (Appendix 8) were performed. The result of descriptive statistics presented that a higher mean and median of the dependent variable in CODs than in MODs. Patterns of distribution of cases in the CODs and in MODs in the histograms confirmed the findings from the descriptive statistical analyses, as expected. The patters appeared to indicate that each of two groups had their own peak at a different value from another group. These findings support the hypothesis that COD, the variable, the difference in the status of Operational District (CODs or MODs) was likely to be the main factor which caused the bimodality (Chapter 4).

In addition, to test whether COD was causing bimodality consistently, regressions were conducted with COD and each one of the other independent variables. From these regressions, plots of dependent variables versus standardised predicted values were produced and those of dependent variables versus standardized residuals were produced. These plots indicated that COD was the main factor which caused the bimodality.

Therefore, in Figure 7.5, if each of two groups of plot points was seen separately, each group appeared not to have heteroscedasticity (Figure 7.5). It is noted that outlier cases disturbed the constant variance in the plot (Figure 7.5); however, judging from the statistics for the Cook's distance stated under Table 7.5, there were no extreme outliers.

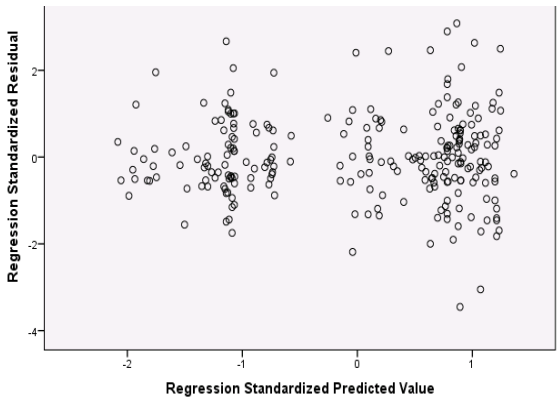


Figure 7.5: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice (Model1) (All health workers, N=250)

Modified white test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.22	0.018	0.2250	5.578	0.200

The p-value, 0.200 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis (homoscedasticity) was not rejected; there is no heteroscedasticity in the model.

2) Primary Nurses

This model regressed only cases of primary nurses (N=117) with the independent variables used for Model 1 except dummy variables for cadres. Controlling for all other variables, the (Ln) income from health work excluding private practice of a primary nurse in CODs was 77.3% ($p < 0.01$) higher than the (Ln) income of a comparable primary nurse in MODs. After exponetiating this coefficient, a COD primary nurse's income was 116.3% ($p < 0.01$) above a comparable MOD primary nurse income. The coefficient was the only coefficient with statistical significance in this model. The higher income was consistent with the result of descriptive statistical analyses. The mean income in CODs was more than double the mean income in MODs (Table 6.4, 7-1-1).

The plot of residuals presented bimodality (Figure 7.6). However, the test result of the modified White test below presented homoscedasticity. The tests to estimate which independent variables caused the bimodality were conducted, as it was done on the all health worker cases. The tests indicated that COD was the main factor which caused the bimodality. Consequently, the plots showed that each of two groups in the plot did not have

heteroscedasticity.

Table 7.6: Result of regression of (Ln) income from health work excluding private practice [Model 1] (Primary Nurses, N = 117)

	Coefficient	Standard Error	t	P >t		Tolerance	VIF
Age	0.118	0.096	1.229	0.222		0.003	329.235
Age Squared	-0.001	0.001	-1.221	0.225		0.003	327.949
Male	0.118	0.110	1.074	0.285		0.642	1.559
COD	0.773	0.082	9.456	0.000	***	0.782	1.278
Married	0.079	0.161	0.489	0.626		0.641	1.561
Economic Status*	0.091	0.107	0.853	0.395		0.773	1.294
Constant	3.667	2.171	1.689	0.094			
Prob. >F	0.000						
R-square	0.509						
R-square adjusted	0.482						
Root MSE	0.391						
AIC	-213.240						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's Distance (maximum) 0.146 < 0.5

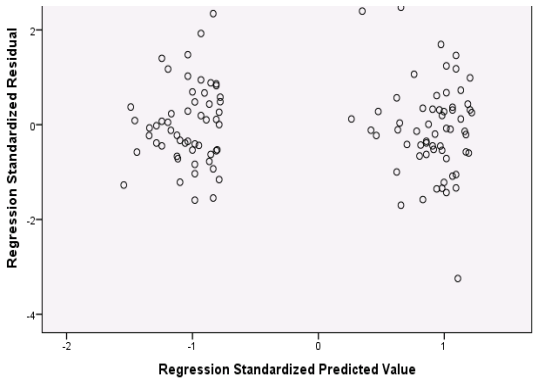


Figure 7.6: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice [Model 1] (Primary Nurses, N = 117)

Modified white test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.022	0.013	0.25967	2.561	0.112

The p-value, 0.112 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis (homoscedasticity) was not rejected; there is no heteroscedasticity in the model.

3) Secondary Nurses

This model regressed only cases of secondary nurses (N=64) with the independent variables used for Model 1 except dummy variables for cadres. Controlling for all other variables, the (Ln) income from health work excluding private practice of a secondary nurse in CODs was 71.1% ($p < 0.01$) higher than the (Ln) income of a secondary nurse in MODs. After exponetiating this coefficient, a COD primary nurse's income was 103.4% ($p < 0.01$) above a comparable MOD primary nurse income. The coefficient was the only coefficient with statistical significance in this model (Table 7.7). The higher income was consistent with the result of descriptive statistical analyses (Table 6.4, 7-1-1).

The plot of residuals appeared to indicate bimodality and heteroscedasticity. In the plot, one of the two groups: the left one, appeared to show heteroscedasticity more clear than the other (Figure 7.7). These features disagreed to result of the modified White test. The result of the modified White result may be due to the number of cases regressed.

Concerning the bimodality, the same tests for testing the contribution of COD as the one conducted on the two groups above (all health workers and primary nurses) were conducted. The tests confirmed that COD was the main factor which caused the bimodality.

Table 7.7: Result of regression of (Ln) income from health work excluding private practice [Model 1] (Secondary Nurses, N = 64)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	0.063	0.055	1.148	0.256		0.011	90.253
Age Squared	-0.001	0.001	-1.187	0.240		0.012	84.968
Male	-0.077	0.174	-0.441	0.661		0.777	1.287
COD	0.710	0.107	6.662	0.000	***	0.760	1.316
Married	0.092	0.211	0.437	0.664		0.527	1.898
Economic Status*	0.032	0.101	0.317	0.753		0.732	1.366
Constant	5.477	1.063	5.154	0.000			
Prob. >F	0.000						
R-square	0.481						
R-square adjusted	0.426						
Root MSE	0.329						
AIC	-135.881						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's Distance (maximum) 0.008 < 0.5

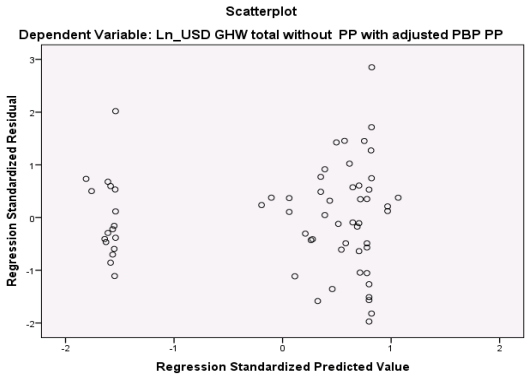


Figure 7.7: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice [Model 1] (Secondary Nurses, N = 64)

Modified white test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.042	0.027	0.14492	2.736	0.103

The p-value, 0.103 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

4) Midwives

This model regressed only cases of midwives (N=61) with the independent variables used for Model 1 except dummy variables for cadres and Male. Controlling for all other variables, the (Ln) income from health work excluding private practice of a midwife in CODs was 87.2% ($p < 0.01$) higher than the (Ln) income of a midwife in MODs. After exponetiating this coefficient, a COD midwife income was 139.2% ($p < 0.01$) above a comparable MOD midwife income. The coefficient was the only coefficient with statistical significance in this model (Table 7.8). The higher income was consistent with the result of descriptive statistical analyses (Table 6.4, 7-1-1).

The plot of the residuals shows bimodality (Figure 7.8). However, test results of the modified White test did not find hetroscedasticity of the model. This disagreement may be brought about by the small size of cases regressed. Concerning the bimodalilty, the tests for

checking the contribution of COD using regressions was conducted. The test results confirmed that COD was the main factor which caused the bimodality. If each group of plot points was seen separately, each group appeared not to have heteroscadasticity. Outlier cases in the plot were not extreme, according to the statistics for Cook's distance (Table 7.8).

Table 7.8: Result of regression of (Ln) income from health work excluding private practice [Model 1] (Midwives, N = 61)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	-0.022	0.066	-0.333	0.741		0.009	115.699
Age Squared	0.000	0.001	0.174	0.863		0.009	115.676
COD	0.872	0.120	7.258	0.000	***	0.696	1.437
Married	0.000	0.121	-0.004	0.997		0.665	1.503
Economic Status*	0.037	0.119	0.306	0.761		0.632	1.583
Constant	6.977	1.389	5.024	0.000			
Prob. >F	0.000						
R-square	0.582						
R-square adjusted	0.544						
Root MSE	0.362						
AIC	-118.138						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance 0.136 < 0.5

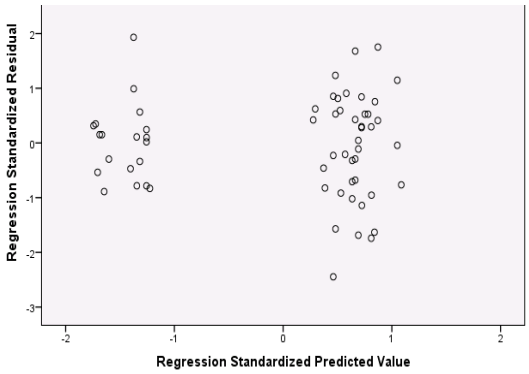


Figure 7.8. Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice) [Model 1] (Midwives N=61)

The modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.040	0.024	1.8694	2.446	0.122

The p-value, 0.122 was insignificant (p > 0.05), therefore, the H_0, the null assumption

hypothesis was not rejected; there is homscedasticity in the model.

(2) Group A Model 2

1) All health workers

Model 2 had, instead of Economic Status, dummy variables for levels of prohibition of dual practice: Prohibition dual practice Mid and Prohibition dual practice Low. All other independent variables were the same as those Model 1 had. Prohibition dual practice Strict was the reference variable for the levels of prohibition.

As seen in Table 7.9, in this model, controlling for all other variables, a health work's (Ln) income from health work excluding private practice in CODs is on average 84.2% ($p < 0.01$) higher than a comparable health worker's (Ln) income from health work excluding private practice in MODs. After exponetiating the coefficient, the income of a health worker in CODs was on average 132.1% ($p < 0.01$) above the income of a comparable health worker in MODs. This result, the higher income was consistent with the result of descriptive statistical analyses (Table 7-1-1). The coefficient of the variable for COD was one of only three variables which were statistically significant ($p < 0.05$) in this model.

Controlling for all other variables, a secondary nurse's (Ln) income from health work excluding private practice was on average 14.8% ($p <0.05$) higher than a comparable primary nurse's (Ln) income from health work excluding private practice (the variable for primary nurses was the reference variable). After exponetiating the coefficient, the income of a secondary nurse was on average 16.0% ($p < 0.05$) above the income of a comparable primary nurse's income. Controlling for all other variables, a primary midwife's (Ln) income from health work excluding private practice was on average 17.5% ($p <0.05$) lower than a comparable primary nurse's (Ln) income from health work excluding private practice. After exponetiating the coefficient, the income from health work excluding private practice of a primary midwife was on average 16.1% ($p < 0.05$) lower than the income of a comparable primary nurse's income (Table 7.9).

Plotting of the residuals of model presented heteroscedasticity and the bimodality (Figure 7.9). These features agreed with the result of the modified White test of the model shown below. The bimodality was tested as to the COD as the main factor which caused the bimodality. The test confirmed COD as the main factor.

Table 7.9: Result of regression of (Ln) income from health work excluding private practice [Model 2] (All health workers, N = 250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.148	0.067	2.204	0.028	**	0.621	1.610
Primary MW	-0.175	0.088	-1.996	0.047	**	0.488	2.050
Secondary MW	0.168	0.113	1.491	0.137		0.629	1.590
Assistant Doctor	0.081	0.176	0.461	0.645		0.880	1.136
Doctor	0.214	0.217	0.989	0.324		0.960	1.041
Age	0.039	0.033	1.173	0.242		0.008	124.928
Age Squared	0.000	0.000	-1.188	0.236		0.008	122.998
Male	0.075	0.083	0.904	0.367		0.333	3.000
Married	0.078	0.078	0.990	0.323		0.704	1.419
COD	0.842	0.085	9.897	0.000	***	0.315	3.178
Prohibition dual practice Mid**	-0.022	0.065	-0.334	0.739		0.634	1.577
Prohibition dual practice Low***	0.088	0.091	0.967	0.335		0.257	3.884
Constant	5.535	0.705	7.846	0.000			
Prob. >F	0.000						
R-square	0.554						
R-square adjusted	0.531						
Root MSE	0.366						
AIC	-490.374						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance : 0.248 < 0.5

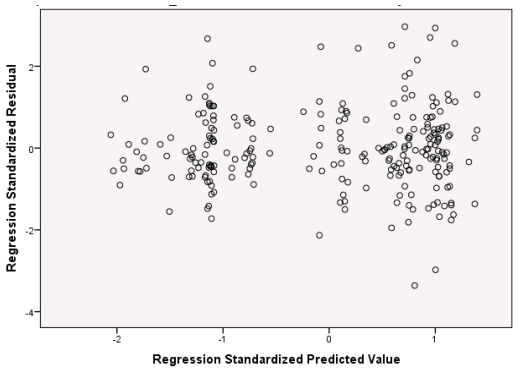


Figure 7.9 Scatter plot of residuals (dependent variable: Ln Icome from health work excluding private practice) [Model 2] (All health workers, N = 250)

Modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.018	0.014	0.22300	4.454	0.036

The p-value, 0.036, was significant ($p < 0.05$), therefore, the H_0, the null assumption hypothesis was rejected; there is heterocedasticity in the model.

2) Primary nurses

This model excluded dummy variable for cadres from the previously described model applied to all health workers' cases. As seen in, in this model, controlling for all other variables, a primary nurse's (Ln) income from health work excluding private practice in CODs is on average 83.2% ($p < 0.01$) higher than a comparable primary nurse's (Ln) income f in MODs. After exponetiating the coefficient, the income f a primary nurse in CODs was on average 129.8% ($p < 0.01$) above the income of a comparable primary nurse in MODs. This result, the higher income was consistent with the result of descriptive statistical analyses (Table 7-1-1). The coefficient of the variable for COD was one of three variables which were statistically significant ($p < 0.05$) in this model.

Plotting of the residuals of model presented the bimodal data feature (Figure 7.10). This feature disagreed with the result of modified White test of the model shown below. The bimodality was tested as to the COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this, if each group of the plot points are seen separately, heteroscedasticity was not seen in the right side group in the plot.

Table 7.10: Result of regression of income from health work excluding private practice [Model 2] (Primary nurses, N = 117)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	0.108	0.097	1.106	0.271		0.003	336.368
Age Squared	-0.001	0.001	-1.088	0.279		0.003	336.052
Male	0.101	0.113	0.893	0.374		0.614	1.630
Married	0.086	0.162	0.530	0.597		0.639	1.566
COD	0.832	0.114	7.306	0.000	***	0.405	2.469
Prohibition dual practice Mid**	-0.054	0.118	-0.459	0.647		0.636	1.573
Prohibition dual practice Low***	0.098	0.131	0.743	0.459		0.318	3.147
Constant	3.887	2.166	1.795	0.075			
Prob. >F	0.000						
R-square	0.511						
R-square adjusted	0.480						
Root MSE	0.391						
AIC	-211.831						

*p < 0.1
**p < 0.05
***p < 0.01

The Cook's distance 0.126

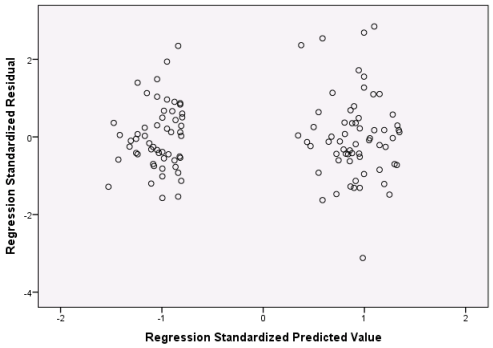


Figure 7.10: Scatter plot of residuals (dependent variable: Ln income excluding private practice) [Model 2] (primary nurse N = 171)

Modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.019	0.010	0.25306	2.176	0.143

The p-value, 0.143 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

3) Secondary Nurses

In this model, controlling for all other variables, a secondary nurse's (Ln) income from health work excluding private practice in CODs is on average 85.6% ($p < 0.01$) higher than a comparable secondary nurse's (Ln) income in MODs. After exponetiating the coefficient, the income a primary nurse in CODs was on average 135.4 % ($p < 0.01$) above the income of a comparable primary nurse in MODs. This result, the higher income was consistent with the result of descriptive statistical analyses (Table 7-1-1). The coefficient of the variable for COD was one of only three variables which were statistically significant ($p < 0.05$) in this model (Table 7.11).

Plotting of the residuals showed bimodality (Figure 7.11). These features disagreed with the result of modified White test which did not indicate hetroscedasticity. This might be brought about by the small size of cases regressed. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Even considering this test result, marginal hetroscadesticity was seen in each group.

Table 7.11: Result of regression of (Ln) income from health work excluding private practice [Model 2] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	0.051	0.056	0.902	0.371		0.011	94.203
Age Squared	-0.001	0.001	-0.929	0.357		0.011	89.003
Male	-0.105	0.175	-0.597	0.553		0.760	1.316
Married	0.144	0.216	0.667	0.508		0.502	1.994
COD	0.856	0.171	5.020	0.000	***	0.296	3.374
Prohibition dual practice Mid**	0.002	0.106	0.017	0.986		0.669	1.495
Prohibition dual practice Low***	0.187	0.171	1.093	0.279		0.256	3.912
Constant	5.547	1.077	5.148	0.000			
Prob. >F	0.000						
R-square	0.492						
R-square adjusted	0.428						
Root MSE	0.328						
AIC	-135.231						
*p < 0.1							
**p < 0.05							
***p < 0.01							

Cook's distance: 0.123 < 0.5

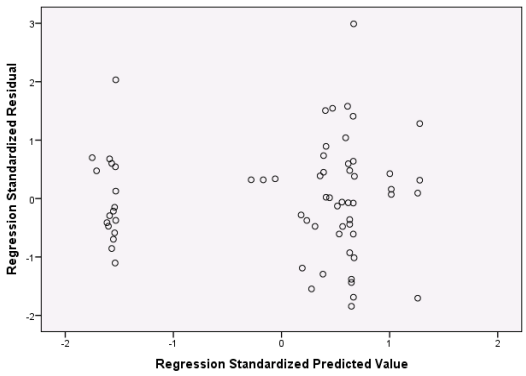


Figure 7. 11: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice) secondary nurse N = 64 (Model 2)

Modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.027	0.011	0.15157	1.705	0.196

The p-value, 0.196 was insignificant ($p > 0.05$), therefore the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

4) Midwives

In this model, controlling for all other variables, a midwife's (Ln) income from health work excluding private practice in CODs is on average 72.6% ($p < 0.05$) higher than a comparable midwife's (Ln) income in MODs. After exponetiating the coefficient, the income of a midwife in CODs was on average 106.7% ($p < 0.05$) above the income of a comparable midwife in MODs (Table 7.12). This result, the higher income was consistent with the result of descriptive statistical analyses (Table 7-1-1). The coefficient of the variable for COD was only the variable which was statistically significant ($p < 0.05$) in this model (Table 7.12). However, the variables for COD and the dual practice prohibition levels indicated much higher VIF (COD: 7.652, Prohibition dual practice Low: 8.213) than the cut-off point (5.0 in Ensor et al. 2009) (Table 7.12).

Plotting of the residuals showed bimodality (Figure 7.12). These features disagreed with the result of modified White test which did not indicate hetroscedasticity. This might be brought about by the small size of cases regressed. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this test result, if the plot points are seen in each group, hetroscadesticity are not seen.

Table 7.12: Result of regression of (Ln) income from health work excluding private practicepractice [Model 2] (Midwives, N = 61)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	-0.021	0.067	-0.317	0.753		0.009	115.762
Age Squared	0.000	0.001	0.160	0.873		0.009	115.727
Married	-0.014	0.124	-0.116	0.908		0.641	1.561
COD	0.726	0.279	2.602	0.012	**	0.131	7.652
Prohibition dual practice Mid**	-0.050	0.122	-0.410	0.683		0.609	1.643
Prohibition dual practice Low***	-0.164	0.282	-0.581	0.563		0.122	8.213
Constant	7.165	1.437	4.987	0.000			
Prob. >F	0.000						
R-square	0.585						
R-square adjusted	0.539						
Root MSE	0.365						
AIC	-116.519						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance 0.402 < 0.5

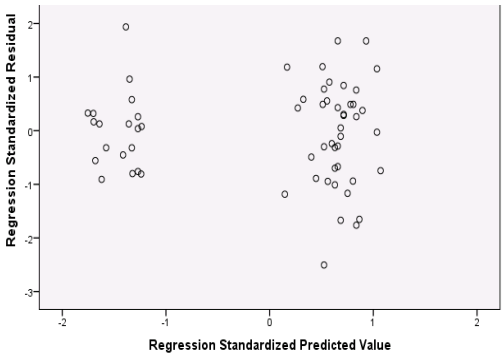


Figure 7. 12: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practicepractice) [Model 2] (midwives, N = 61)

Modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.041	0.025	1.8443	2.535	0.117

The p-value, 0.117 was insignificant (p > 0.05). Therefore, the H_0, the null assumption hypothesis was not rejected, which implies that there is homoscedasticity in the model.

(3) Group B Model 3

1) All heath workers

From all independent variable of Model 1 and 2, this model excluded COD, Economic Status, dummy variable for Prohibition dual practice Mid and Prohibition dual practice Low. Instead, it included Mesang, Peareng, Preah Sdach and Kirivong which were dummy variables for four of the five study site Operational Districts (Table 7.13). They took the form of binary dummy variables, having Kamchay Mea, another Operational District, as the reference variable.

As seen in Table 7.13, in this model, controlling for all other variables, a health worker's (Ln) income from health work excluding private practice in Peareang Operational District is on average 76.9% ($p < 0.01$) higher than a comparable health worker's (Ln) income in Kamchay Mea Operational District, the reference variable. After exponetiating the coefficient, the income of a health worker in Peareang Operational District was on average 115.8% ($p < 0.01$) above the income of a comparable health worker in Kamchay Mea Operational District. The coefficient of the variable for Peareang was one of five variables which were statistically significant ($p < 0.05$) in this model (Table 7.13).

Controlling for all other variables, health worker's (Ln) income from health work excluding private practice in Preah Sdach Operational District is on average 85.6% ($p < 0.01$) higher than a comparable health worker's (Ln) income in Kamchay Mea Operational District. After exponetiating the coefficient, the income of a health worker in Preah Sdach was on average 136.1% ($p < 0.01$) above the income of a comparable health worker in Kamchay Mea Operational District. The coefficient of the variable for Preah Sdach was one of five variables which were statistically significant ($p < 0.05$) (Table 7.13).

Controlling for all other variables, health worker's (Ln) income from health work excluding private practice in Kirivong Operational District is on average 74.7% ($p < 0.01$) higher than a comparable health worker's (Ln) income in Kamchay Mea Operational District. After exponetiating the coefficient, the income of a health worker in Kirivong was on average 111.1% above the income of a comparable health worker in Kamchay Mea Operational District. The coefficient of the variable for Kirivong was one of five variables which were statistically significant ($p < 0.05$) (Table 7.13).

Controlling for all other variables, a secondary nurse's (Ln) income from health work

excluding private practice was on average 15.3% ($p < 0.05$) higher than a comparable primary nurse's (Ln) income. After exponetiating the coefficient, the income of a secondary nurse was on average 16.5% ($p < 0.05$) above the income of a comparable primary nurse's income. Controlling for all other variables, a primary midwife's from health work excluding private practice was on average 18.1% ($p < 0.05$) lower than a comparable primary nurse's (Ln) income. After exponetiating the coefficient, the income of a secondary nurse was on average 16.6% ($p < 0.05$) below the income of a comparable primary nurse's income. These coefficients for variables for secondary nurses and primary midwives were both statistically significant ($p < 0.05$) (Table 7.13).

The plot of the errors shows bimodal features (Figure 7.13). These features agreed with the result of the modified White test below which indicated heteroscedasticity. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this test result, if the plot points are seen in each group, hetroscadesticity may not seen (Figure 7.13).

Table 7.13: Result of regression of (Ln) income from health work except private practice [Model 3] all health workers (N =250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.153	0.068	2.241	0.026	**	0.607	1.646
Primary MW	-0.181	0.089	-2.036	0.043	**	0.478	2.093
Secondary MW	0.166	0.113	1.469	0.143		0.628	1.592
Assistant Doctor	0.088	0.177	0.495	0.621		0.874	1.144
Doctor	0.228	0.219	1.039	0.300		0.942	1.062
Age	0.038	0.033	1.137	0.257		0.008	125.549
Age Squared	0.000	0.000	-1.144	0.254		0.008	123.865
Male	0.070	0.084	0.827	0.409		0.326	3.066
Married	0.080	0.079	1.010	0.313		0.702	1.423
Mesang	0.035	0.079	0.441	0.660		0.616	1.624
Peareng	0.769	0.070	11.047	0.000	***	0.582	1.718
Preah Sdach	0.859	0.093	9.249	0.000	***	0.717	1.394
Kirivong	0.747	0.070	10.652	0.000	***	0.551	1.815
Constant	5.628	0.708	7.952	0.000			
Prob. >F	0.000						
R-square	0.554						
R-square adjusted	0.530						
Root MSE	0.366						
AIC	-488.580						
*p < 0.1							
**p < 0.05							
***p < 0.01							

Cook's distance: 0.231 < 0.5

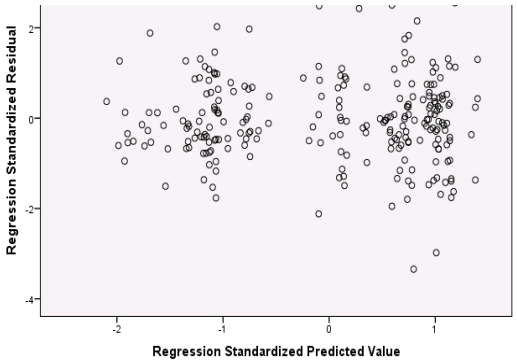


Figure 7.13: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice) [Model 3] (all health workers, N=250)

Modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.018	0.014	0.22300	4.454	0.036

The p-value, 0.036, was significant ($p < 0.05$), therefore, the H_0, the null assumption hypothesis was rejected; there is heteroscedasticity in the model.

2) Primary nurses

This model regressed cases of only primary nurses, excluding the dummy variables for cadres. As seen in Table 7.14, a primary nurse's (Ln) income from health work excluding private practice in Peareang was on average 89.3% ($p < 0.01$) higher than a comparable primary nurse's (Ln) income in Kamchay Mea Operational District, controlling for all other variables. After exponetiating the coefficient, the income of a primary nurse in Peareang Operational District was on average 118.8% ($p < 0.01$) above the income of a comparable primary nurse's income in Kamchay Mea Operational District. This coefficients was one of only three statistically significant independent variables ($p < 0.05$) (Table 7.14).

Controlling for all other variables, a primary nurse's (Ln) income from health work excluding private practice in Preah Sdach was on average 78.3% ($p < 0.01$) higher than a comparable primary nurse's (Ln) income in Kamchay Mea Operational District. After exponetiating the coefficient, the income of a primary nurse in Preah Sdach Operational District was on average 144.2% ($p < 0.01$) above the income of a comparable primary nurse's income in Kamchay Mea Operational District. This coefficients was one of only three

statistically significant independent variables ($p < 0.05$) (Table 7.14).

Controlling for all other variables, a primary nurse's (Ln) income from health work excluding private practice in Krivong Operational District was on average 73.1% ($p < 0.01$) higher than a comparable primary nurse's (Ln) income in Kamchay Mea Operational District. After exponetiating the coefficient, the income of a primary nurse in Kirivong Operational District was on average 107.7% ($p < 0.01$) above the income of a comparable primary nurse's income in Kamchay Mea Operational District. This coefficients was one of only three statistically significant independent variables ($p < 0.05$) (Table 7.14).

These higher incomes of primary nurses were consistent with the result of the descriptive statistical analyses (Table 7-1-2).

The plot of the residuals shows bimodal features (Figure 7.14). These features disagreed with the result of the modified White test below which did not indicate heteroscedasticity. This is possibly due to the small number of cases regressed. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this test result, if the plot points are seen in each group, hetroscadesticity is not seen (Figure 7.14).

Table 7.14: Result of regression of (Ln) income from health work excluding private practice [Model 3] (Primary nurses, N = 117)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	0.095	0.098	0.967	0.336		0.003	341.840
Age Squared	-0.001	0.001	-0.937	0.351		0.003	342.453
Male	0.078	0.115	0.679	0.499		0.591	1.692
Married	0.088	0.162	0.541	0.589		0.639	1.566
Mesang	0.114	0.111	1.032	0.304		0.619	1.616
Peareng	0.783	0.108	7.261	0.000	***	0.670	1.492
Preah Sdach	0.893	0.128	6.970	0.000	***	0.675	1.480
Kirivong	0.731	0.115	6.338	0.000	***	0.668	1.497
Constant	4.209	2.190	1.922	0.057			
Prob. >F	0.000						
R-square	0.516						
R-square adjusted	0.480						
Root MSE	0.391						
AIC	-210.979						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance: 0.110 < 0.5

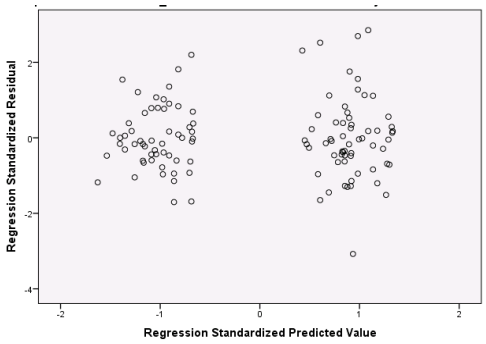


Figure 7.14: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice) [Model 3] (Primary nurses, N = 117)

The modified White test result

R-square n	Adjusted R-square	S. E.	F-value	P-value
0.021	0.013	0.24829	2.520	0.115

The p-value, 0.115 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

3) Secondary Nurses

This model regressed cases of only secondary nurses. As seen in Table 7.16, a secondary nurse's (Ln) income from health work excluding private practice in Peareang Operational District was on average 65.2% ($p < 0.01$) higher than a comparable secondary nurse's (Ln) income in Kamchay Mea Operational District, controlling for all other variables. After exponetiating the coefficient, the income of a secondary nurse in Peareang was on average 91.9% ($p < 0.01$) above the income of a comparable primary nurse's income in Kamchay Mea Operational District. This coefficient was one of only three statistically significant independent variables ($p < 0.05$) (Table 7.15).

Controlling for all other variables, a secondary nurse's (Ln) income from health work excluding private practice in Preah Sdach Operational District was on average 83.3% ($p < 0.01$) higher than a comparable secondary nurse's (Ln) income in Kamchay Mea Operational District. After exponetiating the coefficient, the income of a secondary nurse in Preah Sdach was on average 131.2% ($p < 0.01$) above the income of a comparable secondary nurse's income in Kamchay Mea Operational District. This coefficient was one of only three statistically significant independent variables ($p< 0.05$) (Table 7.15).

Controlling for all other variables, a secondary nurse's (Ln) income from health work excluding private practice in Kirivong was on average 65.4% ($p < 0.01$) higher than a comparable secondary nurse's (Ln) income in Kamchay Mea Operational District. After exponetiating the coefficient, the income of a secondary nurse in Kirivong was on average 92.3% ($p < 0.01$) above the income of a comparable secondary nurse's income in Kamchay Mea. This coefficient was one of only three statistically significant independent variables ($p < 0.05$) (Table 7.15).

The plot of the residuals shows bimodal features (Figure 7.14). These features disagreed with the result of the modified White test below which did not indicate heteroscedasticity. This is possibly due to the small number of cases. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this test result, if the plot points are seen in each group, marginal hetroscadesticity was seen (Figure 7.15).

The higher incomes were consistent with the results of descriptive statistical analyses (Table 7-1-3).

Table 7.15: Result of regression of (Ln) income from health work excluding private practice [Model 3] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	0.051	0.057	0.901	0.372		0.011	94.227
Age Squared	-0.001	0.001	-0.929	0.357		0.011	89.035
Male	-0.104	0.177	-0.591	0.557		0.760	1.316
Married	0.144	0.217	0.661	0.511		0.502	1.994
Mesang	-0.074	0.189	-0.394	0.695		0.815	1.227
Peareng	0.652	0.122	5.354	0.000	***	0.535	1.868
Preah Sdach	0.838	0.177	4.724	0.000	***	0.752	1.329
Kirivong	0.654	0.125	5.240	0.000	***	0.486	2.059
Constant	5.745	1.105	5.199	0.000			
Prob. >F	0.000						
R-square	0.493						
R-square adjusted	0.419						
Root MSE	0.331						
AIC	-133.411						
*p < 0.1							
**p < 0.05							
***p < 0.01							

Cook's distance 0.108 < 0.5

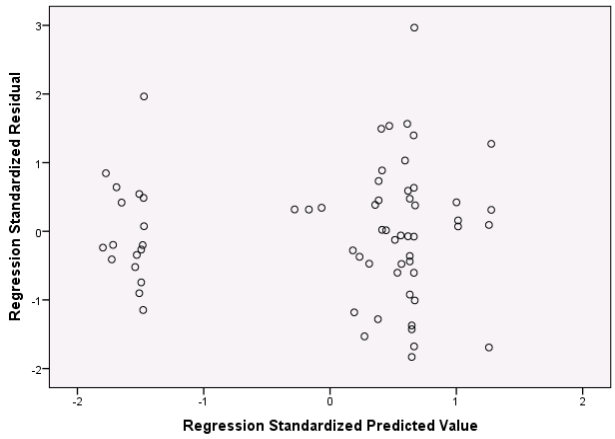


Figure 7.15: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice) [Model 3] (secondary nurse N = 64)

The modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.029	0.013	0.15084	1.850	0.179

The p-value, 0.179 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

4) Midwives

This model regressed cases of only midwife cases, excluding the dummy variables for cadres and Male. A secondary nurse's (Ln) income from health work excluding private practice in Peareang Operational District was on average 82.3% ($p < 0.01$) higher than a comparable midwife's (Ln) income in Kamchay Mea Operational District, controlling for all other variables. After exponetiating the coefficient, the income a secondary nurse in Peareang Operational District was on average127.7% ($p < 0.01$) above the income of a comparable primary nurse's income in Kamchay Mea Operational District. This coefficient was one of only three statistically significant independent variables ($p < 0.05$) (Table 7.16).

A midwife's (Ln) income from health work excluding private practice in Preah Sdach Operational District was on average 65.9% ($p < 0.05$) higher than a comparable midwife's (Ln) in Kamchay Mea Operational District, controlling for all other variables. After

exponetiating the coefficient, the income of a midwife in Peareang was on average 93.3% ($p < 0.05$) above the income of a comparable midwife'sincome in Kamchay Mea Operational District. This coefficient was one of only three statistically significant independent variables ($p < 0.05$) (Table 7.16).

A midwife's (Ln) income from health work excluding private in Kirivong Operational District was on average 77.4% ($p < 0.01$) higher than a comparable midwife's (Ln) income in Kamchay Mea Operational District, controlling for all other variables. After exponetiating the coefficient, the income of a midwife in Peareang was on average 116.84% ($p < 0.05$) above the income of a comparable midwife's income in Kamchay Mea Operational District. This coefficient was one of only three statistically significant independent variables ($p < 0.05$) (Table 7.16).

The plot of the residuals shows bimodal features (Figure 7.16). These features disagreed with the result of the modified White test below which did not indicate heteroscedasticity. This is possibly due to the small number of cases regressed. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this test result, if the plot points are seen in each group, hetroscadesticity is not seen (Figure 7.16).

Table 7.16 Result of regression of income from health work excluding private practice [Model 3] (Midwives, N = 61)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	-0.015	0.068	-0.220	0.827		0.008	118.618
Age Squared	0.000	0.001	0.061	0.951		0.008	118.876
Married	-0.017	0.125	-0.139	0.890		0.639	1.564
Mesang	-0.105	0.177	-0.590	0.558		0.445	2.248
Peareng	0.823	0.168	4.887	0.000	***	0.402	2.487
Preah Sdach	0.659	0.302	2.181	0.034	**	0.761	1.314
Kirivong	0.774	0.161	4.808	0.000	***	0.357	2.801
Constant	6.946	1.425	4.875	0.000			
Prob. >F	0.000						
R-square	0.588						
R-square adjusted	0.533						
Root MSE	0.367						
AIC	-114.919						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance 0.347 < 0.5

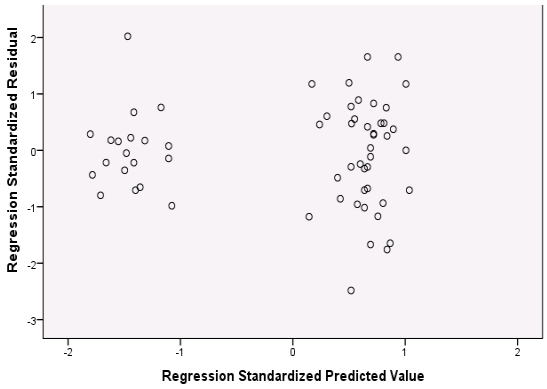


Figure 7.16: Scatter plot of residuals (dependent variable: Ln income from health work excluding private practice) [Model 3] (midwives N = 61)

Result of modified White test

R-square	Adjusted R-square	S. E.	F-value	P-value
0.042	0.026	1.8617	2.596	0.112

The p-value, 0.112 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

7.3.2 Income from heath work including private practice

The hypothesis of the dependent and independent variables were described in Chapter 4 (4.3.3.(8).b., c.). However, the main point of hypotheses is repeated here. The impact of payments associated with the contracting settings was likely to still be revealed in regressions of this income, despite the inclusion of private practice income in this income category.

Prior to multivariate regressions, univariate regressions of the income from health work including private practice as the dependent variable applying each independent variable (Table 7.17) were undertaken. The R-squares for the variables, other statistics including the p-value for the model and that of the independent variable were tested. According to the cut-off point, i.e, 0.2 (Chapter 4 (4.3.3 (8) d), Household Size was excluded (Table 7.17).

Table 7.17: Result of univariate regressions of income from health work including private practice

	R	R Square	Adjusted R Square	S.E.	Sig.(model)
Prohibition of Private Practice	0.153	0.023	0.016	0.633	0.053
Cadre	0.367	0.134	0.177	0.600	0.000
Age	0.163	0.026	0.023	0.631	0.010
Age Squ	0.167	0.028	0.024	0.631	0.008
Male	0.199	0.040	0.036	0.627	0.002
COD	0.188	0.035	0.032	0.628	0.003
Household size	0.007	0.000	-0.004	0.640	0.910
5ODs	0.200	0.040	0.024	0.631	0.040
Economic Status	0.129	0.017	0.013	0.634	0.042
Married	0.143	0.020	0.016	0.633	0.024
Age, Age Squ	0.170	0.029	0.021	0.632	0.024

S.E. :Standard Error of the Estimate

(1) Group A Model 1

1) All health workers

As seen in Table 7.18, in this model, controlling for all other variables, a health worker's (Ln) income from health work including private in CODs was on average 23.6% ($p < 0.01$) higher than a comparable health worker's (Ln) income in MODs. After exponetiating the coefficient, the income from health work including private practice of a health worker in CODs was on average 26.6% ($p < 0.01$) above the income of a comparable health worker in MODs. The coefficient of the variable for COD was one of four variables which were statistically significant ($p < 0.05$) in this model (Table 7.18).

As seen in Table 7.18, in this model, controlling for all other variables, a primary midwife's (Ln) income from health work including private was on average 39.9% ($p < 0.01$) lower than a comparable primary nurse's (Ln) income. After exponetiating the coefficient, the income of a primary midwife was on average 32.9% ($p < 0.01$) below the income of a comparable primary midwife's income. Controlling for all other variables, a doctor's (Ln) income from health work including private practice was on average 82.4% ($p < 0.05$) lower than a comparable primary nurse's (Ln) income (Table 7.18). After exponetiating the coefficient, the income of a doctor was on average128.0% ($p < 0.05$) above the income of a comparable primary nurse's income. These coefficients for variables for primary midwives and doctors were both statistically significant ($p < 0.05$) (Table 7.18). However, it is noted that the number of doctor cases is small (N=3).

The plot of the residuals did not show heteroscedasticity (Figure 7.17). The features agreed with the result of the modified White test below which did not indicate heteroscedasticity.

Table 7.18: Result of regressions of (Ln) income from health work including private practice [Model 1] (All health workers, N=250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.148	0.106	1.397	0.164		0.639	1.566
Primary MW	-0.399	0.141	-2.837	0.005	***	0.488	2.049
Secondary MW	0.148	0.181	0.820	0.413		0.630	1.587
Assistant Doctor	-0.186	0.282	-0.661	0.509		0.882	1.133
Doctor	0.824	0.346	2.380	0.018	**	0.967	1.034
Age	0.091	0.053	1.718	0.087	*	0.008	123.960
Age Squared	-0.001	0.001	-1.880	0.061		0.008	121.753
Male	0.089	0.131	0.680	0.497		0.347	2.881
Married	0.001	0.125	0.011	0.991		0.716	1.397
COD	0.236	0.088	2.671	0.008	***	0.747	1.338
Economic Status*	-0.102	0.098	-1.040	0.299		0.717	1.394
Constant	5.496	1.120	4.908	0.000			
Prob. >F	0.000						
R-square	0.195						
R-square adjusted	0.158						
Root MSE	0.586						
AIC	-255.612						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance :0.340 < 0.5

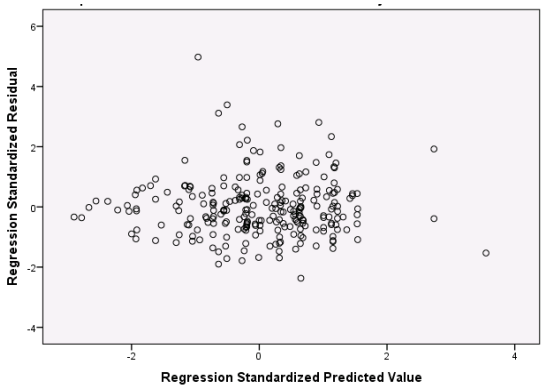


Figure 7.17: Scatter plot of residuals (dependent variable: Ln income from health work including private practice) [Model 1] (all health workers, N=250)

Modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.000	-0.004	0.73688	0.031	0.859

The p-value, 0.859, was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

2) Primary Nurses

None of the three models, Model 1 to 3 applied to cases in primary nurses, gave coefficients with statistical significance (Table 7.19, 7.23, 7.27). Also the three models did not obtain the F-value with the statistical significance ($p < 0.05$). Inclusion of private practice income in the income regressed as the dependent variable seemed to bring about these results, since the private practice incomes have variances as seen in the result of descriptive statistical analyses (Table 7-1-1, 7-1-3). The means were lower in CODs than in MODs.

Table 7.19: Result of regressions of (Ln) income from health work including private practice [Model 1] (Primary nurses, N = 117)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.130	0.167	0.783	0.435	0.003	329.235
Age Squared	-0.002	0.002	-0.869	0.387	0.003	327.949
Male	0.098	0.190	0.514	0.608	0.642	1.559
COD	0.160	0.141	1.127	0.262	0.782	1.278
Married	-0.088	0.279	-0.316	0.752	0.641	1.561
Economic Status*	-0.108	0.185	-0.583	0.561	0.773	1.294
Constant	4.750	3.756	1.265	0.209		
Prob. >F	0.503					
R-square	0.046					
R-square adjusted	-0.006					
Root MSE	0.676					
AIC	-85.000					
*p < 0.1						
**p < 0.05						
***p < 0.01						

3) Secondary Nurses

Similar to the results of regression of primary nurse cases, none of the three models gave coefficients with statistical significance (Table 7.20). Also, the three models did not obtain the F-value with statistical significance. Inclusion of private practice income in this income seemed to bring about these results.

Table 7.20: Result of regressions of (Ln) income from health work including private practice [Model 1] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.073	0.096	0.759	0.451	0.011	90.253
Age Squared	-0.001	0.001	-0.859	0.394	0.012	84.968
Male	0.106	0.301	0.352	0.726	0.777	1.287
COD	0.246	0.185	1.334	0.187	0.760	1.316
Married	0.309	0.365	0.845	0.402	0.527	1.898
Economic Status*	-0.075	0.175	-0.427	0.671	0.732	1.366
Constant	5.771	1.841	3.135	0.003		
Prob. >F	0.567					
R-square	0.079					
R-square adjusted	-0.018					
Root MSE	0.569					
AIC	-65.568					
*p < 0.1						
**p < 0.05						
***p < 0.01						

4) Midwives

In the cases in midwives, the higher income in CODs was clearly indicated. As seen in Table 7.21, in this model, controlling for all other variables, a midwife's (Ln) income from health work including private in CODs was on average 50.3% ($p < 0.01$) higher than a comparable

midwife's (Ln) income in MODs. After exponetiating the coefficient, the income from health work including private practice of a midwife in CODs was on average 65.4% ($p < 0.01$) above the income of a comparable midwife in MODs. The coefficient for the variable was only one variable which were statistically significant ($p < 0.05$) in this model (Table 7.21).

The plot of the residuals shows bimodal features (Figure 7.18). This feature disagreed with the result of the modified White test below which did not indicate heteroscedasticity. This is possibly due to the small number of cases. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this test result, if the plot points are seen in each group, hetroscadesticity is not seen (Figure 7.18).

Table 7.21. : Result of regressions of (Ln) income from health work including private practice [Model 1] (Midwives, N = 61)

	Coefficient	Standad Error	t	P > t		Tolerance	VIF
Age	-0.050	0.079	-0.633	0.529		0.009	115.699
Age Squared	0.000	0.001	0.443	0.659		0.009	115.676
COD	0.503	0.142	3.546	0.001	***	0.696	1.437
Married	-0.027	0.143	-0.190	0.850		0.665	1.503
Economic Status*	-0.062	0.141	-0.439	0.662		0.632	1.583
Constant	8.140	1.641	4.960	0.000			
Prob. >F	0.001						
R-square	0.324						
R-square adjusted	0.262						
Root MSE	0.428						
AIC	-97.763						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance: 0.293 < 0.5

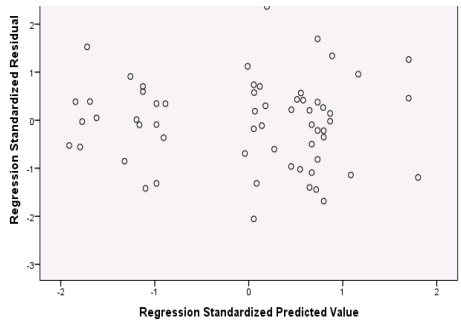


Figure 7.18: Scatter plot of residuals (dependent variable: Ln income from health work including private practice) [Model 1] (midwives, N = 61)

The modified White result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.034	0.018	0.2556	2.070	0.156

The p-value, 0.156 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

(2) Group A Model 2

1) All health workers

This Group A Model 2 did not include Economic Status but include Prohibition dual practice Mid and Prohibition dual practice Low (Table 7.22). As seen in Table 7.22, in this model, controlling for all other variables, a health worker's (Ln) income from health work including private practice in CODs was on average 24.5% ($p < 0.1$) higher than a comparable health worker's (Ln) income in MODs. After exponetiating the coefficient, the income from health work including private practice of a health worker in CODs was on average 27.8% ($p < 0.1\%$) above the income of a comparable health worker in MODs. However, the coefficient of the variable for COD was not statistically significant ($p > 0.05$) (Table 7.22).

As seen in Table 7.22, in this model, controlling for all other variables, a primary midwife's (Ln) income from health work including private was on average 39.9% ($p <0.01$) lower than a comparable primary nurse's (Ln) income. After exponetiating the coefficient, the income of a primary midwife was on average 49.0% ($p < 0.01$) below the income of a comparable primary nurse's income. Controlling for all other variables, a doctor's (Ln) income from health work including private was on average 82.6% ($p <0.05$) lower than a comparable primary nurse's (Ln) income (Table 7.22). After exponetiating the coefficient, the income of a doctor was on average 128.4% ($p < 0.05$) above the income of a comparable primary nurse's income. These coefficients for variables for primary midwives and doctors were only two statistically significant variables ($p < 0.05$) (Table 7.18). However, it is noted that the number of doctor cases is small (N=3).

The plot of the residuals shows bimodal features (Figure 7.19). The features disagreed with the result of the modified White test below which did not indicate heteroscedasticity. This is possibly due to the small number of cases (Figure 7.19).

Table 7.22: Result of regressions of (Ln) income from health work including private practice [Model 2] (All health workers N = 250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.150	0.108	1.389	0.166		0.621	1.610
Primary MW	-0.399	0.141	-2.829	0.005	**	0.488	2.050
Secondary MW	0.147	0.181	0.814	0.416		0.629	1.590
Assistant Doctor	-0.185	0.283	-0.655	0.513		0.880	1.136
Doctor	0.826	0.348	2.374	0.018	**	0.960	1.041
Age	0.091	0.053	1.700	0.090	*	0.008	124.928
Age Squared	-0.001	0.001	-1.859	0.064	*	0.008	122.998
Male	0.087	0.134	0.649	0.517		0.333	3.000
Married	0.003	0.126	0.021	0.983		0.704	1.419
COD	0.245	0.137	1.792	0.074	*	0.315	3.178
Prohibition dual practice Mid**	0.105	0.105	1.004	0.316		0.634	1.577
Prohibition dual practice Low***	0.012	0.147	0.082	0.935		0.257	3.884
Constant	5.388	1.133	4.757	0.000			
Prob. >F	0.000						
R-square	0.195						
R-square adjusted	0.154						
Root MSE	0.587						
AIC	-253.619						
*p < 0.1							
**p < 0.05							
***p < 0.01							

Cook's distance 0.216

The plot of the residual appeared to have homoscedasticity (Figure 7. 19).

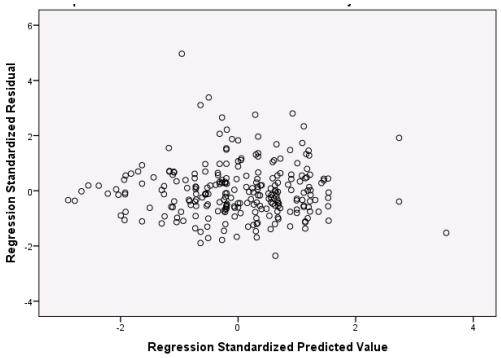


Figure 7.19: Scatter plot of residuals (dependent variable: Ln income from health work including private practice) [Model 2] (All health workers N = 250)

The modified White result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.000	-0.004	0.73676	0.025	0.874

The p-value, 0.874, was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

2) Primary Nurses

3) Secondary Nurses

4) Midwives

Model 2 applied to cases in primary and secondary nurses and midwives failed to obtain the statistical significance for F-value for the model equation and for all coefficients of variables in the regressions failed to obtain. Results of the regressions are shown only in tables below.

Table 7.23 : Result of regressions of (Ln) income from health work including private practice [Model 2] (Primary nurses, N = 117)

	Coefficient	Stdandar Error	t	P > t	Tolerance	VIF
Age	0.123	0.169	0.727	0.469	0.003	336.368
Age Squared	-0.002	0.002	-0.807	0.421	0.003	336.052
Male	0.085	0.195	0.436	0.663	0.614	1.630
Married	-0.083	0.281	-0.297	0.767	0.639	1.566
COD	0.202	0.197	1.021	0.310	0.405	2.469
Prohibition dual practice Mid**	0.134	0.205	0.656	0.513	0.636	1.573
Prohibition dual practice Low***	0.070	0.228	0.307	0.760	0.318	3.147
Constant	4.735	3.754	1.261	0.210		
Prob. >F	0.612					
R-square	0.047					
R-square adjusted	-0.014					
Root MSE	0.678					
AIC	-83.101					
*p < 0.1						
**p < 0.05						
***p < 0.01						

Table 7.24 : Result of regressions of (Ln) income from health work including private practice [Model 2] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.067	0.098	0.681	0.498	0.011	94.203
Age Squared	-0.001	0.001	-0.774	0.442	0.011	89.003
Male	0.093	0.307	0.305	0.762	0.760	1.316
Married	0.331	0.377	0.878	0.384	0.502	1.994
COD	0.310	0.298	1.040	0.303	0.296	3.374
Prohibition dual practice Mid**	0.089	0.185	0.485	0.630	0.669	1.495
Prohibition dual practice Low***	0.082	0.299	0.273	0.786	0.256	3.912
Constant	5.712	1.885	3.031	0.004		
Prob. >F	0.677					
R-square	0.080					
R-square adjusted	-0.035					
Root MSE	0.574					
AIC	-63.653					
*p < 0.1						
**p < 0.05						

Table 7.25: Result of regressions of (Ln) income from health work including private practice [Model 2] (Midwives, N = 61)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	-0.049	0.079	-0.618	0.539	0.009	115.762
Age Squared	0.000	0.001	0.430	0.669	0.009	115.727
Married	-0.041	0.147	-0.276	0.783	0.641	1.561
COD	0.364	0.330	1.102	0.275	0.131	7.652
Prohibition dual practice Mid**	0.049	0.145	0.338	0.737	0.609	1.643
Prohibition dual practice Low***	-0.157	0.333	-0.470	0.640	0.122	8.213
Constant	8.223	1.700	4.838	0.000		
Prob. >F	0.001					
R-square	0.327					
R-square adjusted	0.252					
Root MSE	0.431					
AIC	-96.012					
*p < 0.1						
**p < 0.05						
***p < 0.01						

(3) Group B Model 3

1) All health workers

This Group A Model 2 did not include Economic Status but include Prohibition dual practice Mid and prohibition dual practice Low (Table 7.26). As seen in Table 7.26, in this model, controlling for all other variables, a health worker's (Ln) income from health work including private in Peareang was on average 28.3% ($p < 0.05$) higher than a comparable health worker's (Ln) income in Kamchay Mea. After exponetiating the coefficient, the income from health work including private practice of a health worker in Peareang was on average 32.7% ($p < 0.05$) above the income of a comparable health worker in Kamchaly Mea. However, the coefficient of the variable for COD was not statistically significant ($p > 0.05$) (Table 7.26).

Controlling for all other variables, a health worker's (Ln) income from health work including private in Preah Sdach was on average 30.1% ($p < 0.05$) higher than a comparable health worker's (Ln) income in Kamchay Mea. After exponetiating the coefficient, the income from health work including private practice of a health worker in Peareang was on average 35.1% ($p < 0.05$) above the income of a comparable health worker in Kamchaly Mea. However, the coefficient of the variable for COD was not statistically significant ($p > 0.05$) (Table 7.26).

Controlling for all other variables, a health worker's (Ln) income from health work including private in Kirivong 38.9% ($p < 0.01$) was higher than a comparable health worker's (Ln) income in Kamchay Mea. After exponetiating the coefficient, the income from health work including private practice of a health worker in Peareang was on average 47.6% ($p < 0.01$) above the income of a comparable health worker in Kamchaly Mea. However, the coefficient of the variable for COD was not statistically significant ($p > 0.05$) (Table 7.22).

Coefficients for these three variables were three of 5 variables with statistical significance. However, the higher incomes in these three individual CODs were inconsistent with the result of descriptive statistics, if the mean incomes were compared between the three CODs and Kamchay Mea (the reference variable). This inconsistency might be attributable to the data structure of the income in Kamchay Mea. The Kamchay Mea income had high value of the standard deviance compared to the mean. In contrast, the median in the three CODs were higher than Kamchay Mea (Table 7-1-1), and this was consistent with the regression result, i.e., higher incomes in CODs than MODs.

As seen in Table 7.26, in this model, controlling for all other variables, a primary midwife's (Ln) income from health work including private was on average 41.8% ($p < 0.01$) lower than a comparable primary nurse's (Ln) income. After exponetiating the coefficient, the income of a primary midwife was on average 34.6% ($p < 0.01$) below the income of a comparable primary midwife's income. Controlling for all other variables, a doctor's (Ln) income from health work including private was on average 87.3% ($p < 0.05$) lower than a comparable primary nurse's (Ln) income. After exponetiating the coefficient, the income of a doctor was on average139.4% ($p < 0.05$) above the income of a comparable primary nurse's income. These coefficients for variables for primary midwives and doctors were statistically significant variables ($p < 0.05$) (Table 7.26). However, it is noted that the number of doctor cases is small (N=3).

The plot of the residuals shows bimodal features (Figure 7.20). The features disagreed with the result of the modified White test below which did not indicate heteroscedasticity. This is possibly due to the small number of cases or outliers (Figure 7.20) which were still not extreme according to the statistics for Cook' s distance (Table 7.26)

Table 7.26 : Result of regressions of (Ln) income from health work including private practice [Model 3] (All health workers, N = 250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.165	0.109	1.513	0.132		0.607	1.646
Primary MW	-0.418	0.142	-2.936	0.004	***	0.478	2.093
Secondary MW	0.140	0.181	0.775	0.439		0.628	1.592
Assistant Doctor	-0.163	0.284	-0.573	0.567		0.874	1.144
Doctor	0.873	0.351	2.483	0.014	**	0.942	1.062
Age	0.087	0.053	1.629	0.105		0.008	125.549
Age Squared	-0.001	0.001	-1.773	0.078	*	0.008	123.865
Male	0.068	0.135	0.502	0.616		0.326	3.066
Married	0.009	0.126	0.071	0.943		0.702	1.423
Mesang	0.120	0.127	0.948	0.344		0.616	1.624
Peareng	0.283	0.112	2.534	0.012	**	0.582	1.718
Preah Sdach	0.301	0.149	2.020	0.044	**	0.717	1.394
Kirivong	0.389	0.112	3.457	0.001	***	0.551	1.815
Constant	5.414	1.135	4.772	0.000			
Prob. >F	0.000						
R-square	0.198						
R-square adjusted	0.154						
Root MSE	0.587						
AIC	-252.569						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance : 0.208 < 0.5

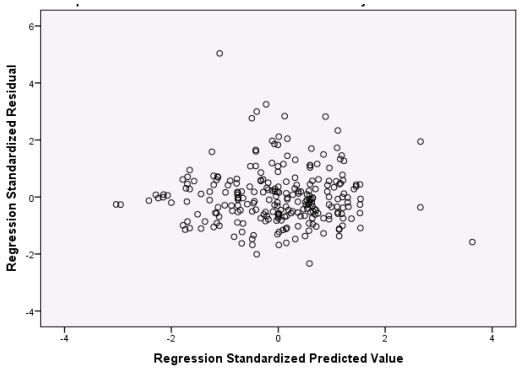


Figure 7.20: Scatter plot of residuals (dependent variable: Ln income from health work including private practice) [Model 3] (All health workers N = 250)

The modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.000	-0.004	0.74257	0.03	0.955

The p-value, 0.955, was significant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

2) Primary nurses

3) Secondary nurses

Model 3 applied to cases of primary and secondary nurses failed to obtain statistical significance to its F-value as well as coefficients of all variables entered, as seen below (Table 7.27, 7.28).

Table 7.27 : Result of regressions of (Ln) income from health work including private practice [Model 3] (Primary nurses, N = 117)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	0.099	0.170	0.584	0.561		0.003	341.840
Age Squared	-0.001	0.002	-0.651	0.516		0.003	342.453
Male	0.044	0.199	0.219	0.827		0.591	1.692
Married	-0.080	0.280	-0.285	0.776		0.639	1.566
Mesang	0.209	0.192	1.091	0.278		0.619	1.616
Peareng	0.220	0.187	1.177	0.242		0.670	1.492
Preah Sdach	0.312	0.222	1.408	0.162		0.675	1.480
Kirivong	0.359	0.200	1.796	0.075	*	0.668	1.497
Constant	5.215	3.795	1.374	0.172			
Prob. >F	0.582						
R-square	0.058						
R-square adjusted	-0.012						
Root MSE	0.678						
AIC	-82.383						

*p < 0.1
**p < 0.05
***p < 0.01

Table 7.28: Result of regressions of (Ln) income from health work including private practice [Model 3] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.066	0.099	0.669	0.506	0.011	94.227
Age Squared	-0.001	0.001	-0.760	0.450	0.011	89.035
Male	0.093	0.309	0.301	0.765	0.760	1.316
Married	0.332	0.380	0.872	0.387	0.502	1.994
Mesang	0.150	0.331	0.454	0.651	0.815	1.227
Peareng	0.263	0.213	1.235	0.222	0.535	1.868
Preah Sdach	0.345	0.310	1.113	0.270	0.752	1.329
Kirivong	0.353	0.218	1.617	0.112	0.486	2.059
Constant	5.771	1.932	2.987	0.004		
Prob. >F	0.754					
R-square	0.083					
R-square adjusted	-0.050					
Root MSE	0.578					
AIC	-61.893					

*p < 0.1
**p < 0.05
***p < 0.01

4) Midwives

As seen in Table 7.29, in this model, controlling for all other variables, a midwife's (Ln) income from health work including private in Peareang was on average 50.5% ($p < 0.05$) higher than a comparable midwife's (Ln) income in Kamchay Mea. After exponetiating the coefficient, the income from health work including private practice of a midwife in Peareang was on average 65.7% ($p < 0.05$) above the income of a comparable midwife in Kamchay Mea. The coefficient for the variable was one of the two variables which were statistically significant ($p < 0.05$) in this model (Table 7.29).

Controlling for all other variables, a midwife's (Ln) income from health work including private in Kirivong was on average 55.5% ($p < 0.01$) higher than a comparable midwife's (Ln) income in Kamchay Mea. After exponetiating, the coefficient, the income from health work including private practice of a midwife in Kirivong was on average 74.2% ($p < 0.01$) above the income of a comparable midwife in MODs. The coefficient for the variable was statistically significant ($p < 0.05$).

The plot of the residuals shows bimodal features (Figure 7.21). These features disagreed with the result of the modified White test below which did not indicate heteroscedasticity. This is possibly due to the small number of cases. The bimodality was tested as to COD as the main factor which caused the bimodality. The test confirmed COD as the main factor. Considering this test result, if the plot points are seen in each group, hetroscadesticity is not seen (Figure

7.21).

Table 7.29: Result of regressions of (Ln) income from health work including private practice [Model 3] (Midwives, N = 61)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	-0.047	0.081	-0.587	0.560		0.008	118.618
Age Squared	0.000	0.001	0.402	0.689		0.008	118.876
Married	-0.041	0.148	-0.278	0.782		0.639	1.564
Mesang	-0.023	0.210	-0.112	0.912		0.445	2.248
Peareng	0.505	0.200	2.529	0.014	**	0.402	2.487
Preah Sdach	0.349	0.359	0.972	0.336		0.761	1.314
Kirivong	0.555	0.191	2.904	0.005	***	0.357	2.801
Constant	8.054	1.691	4.763	0.000			
Prob. >F	0.003						
R-square	0.327						
R-square adjusted	0.238						
Root MSE	0.435						
AIC	-94.027						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance: 0.246 < 0.5

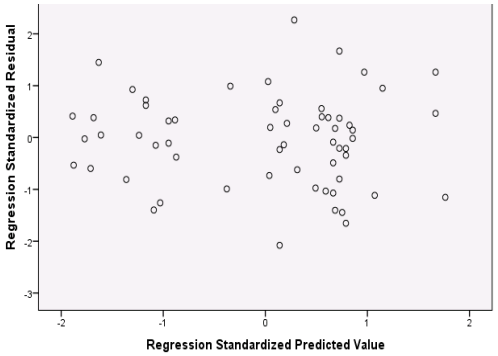


Figure 7.21: Scatter plot of residuals (dependent variable: Ln income from health work including private practice) [Model 2] (Midwives, N = 61)

The modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.036	0.019	0.25302	2.192	0.144

The p-value, 0.144 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homocedasticity in the model.

7.3.3. Total household income

The total household income in CODs was hypothesised to be increased by the payments associate with the contracting settings, thus, it was likely to be higher than in MODs. In relation to the total income the proportion of these payments was hypothesised to be high. Hypotheses of independent variables were described in Chapter 4.

Prior to multivariate regressions, using the logged total household income, univariate regressions applying each independent variable were undertaken in order to test the R-squares for the variables, other statistics including p-value for the model (Table 7.30). The variables for household size (HHSize) was excluded from the equation.

Table 7.30: Results of univariate regression of (Ln) total income of households of health (All health workers, N = 250)

	R	R Square	Adjusted R Square	S.E.	Sig.(model)
Cadre	0.323	0.104	0.086	0.723	0.000
Male	0.216	0.046	0.043	0.740	0.001
Married	0.197	0.039	0.035	0.743	0.002
COD	0.179	0.032	0.028	0.746	0.004
5ODs	0.178	0.032	0.016	0.750	0.094
Prohibition of Private Practice	0.152	0.023	0.015	0.751	0.056
Age	0.119	0.014	0.010	0.753	0.060
Age, Age Squ	0.137	0.019	0.011	0.752	0.097
Economic Status	0.084	0.007	0.003	0.755	0.185
Household size	0.042	0.002	-0.002	0.757	0.510

S.E. :Standard Error of the Estimate

(1) Group A Model 1

1) All health workers

As seen in Table 7.31 in this model, controlling for all other variables, a health worker's (Ln) total household income in CODs was on average 29.2% ($p < 0.01$) higher than a comparable health worker's (Ln) total household income. After exponetiating, the coefficient, the income of a health worker in CODs was on average 33.9% ($p < 0.05$) above the income of a comparable health worker in MODs. The coefficient of the variable for COD was the only variable with statistical significance ($p > 0.05$) (Table 7.31). The higher income in CODs was consistent with the result of descriptive statistical analyses (Table 7-1-2).

Plotting of residuals did not indicate heterocedasticity (Figure 7. 22). This feature was consistent with the result of the modified White test. In the plot, the outliers were checked by the statistics of Cook's distance and found not to be extreme (Table 7.31).

Table 7.31 : Result of regressions of (Ln) total household income [Model 1] (All health worker, N = 250)

	Coefficients	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.227	0.128	1.766	0.079	*	0.639	1.566
Primary MW	-0.308	0.170	-1.814	0.071	*	0.488	2.049
Secondary MW	0.171	0.218	0.784	0.434		0.630	1.587
Assistant Doctor	-0.323	0.340	-0.950	0.343		0.882	1.133
Doctor	0.648	0.418	1.551	0.122		0.967	1.034
Age	0.109	0.064	1.711	0.088	*	0.008	123.960
Age Squared	-0.001	0.001	-1.801	0.073	*	0.008	121.753
Male	0.138	0.158	0.875	0.383		0.347	2.881
Married	0.156	0.151	1.037	0.301		0.716	1.397
COD	0.292	0.107	2.731	0.007	***	0.747	1.338
Economic Status*	-0.037	0.119	-0.315	0.753		0.717	1.394
Constant	5.023	1.352	3.715	0.000			
Prob. >F	0.000						
R-square	0.164						
R-square adjusted	0.126						
Root MSE	0.707						
AIC	12.000						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance: 0.340 < 0.5

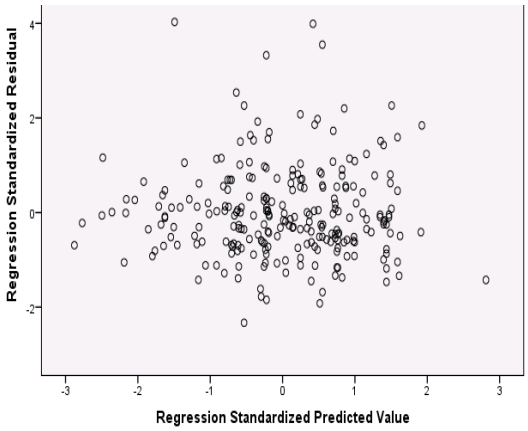


Figure 7.22: Scatter plot of residuals (dependent variable: Ln Total household income) [Model 1] (All health workers, N=250)

The modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.001	-0.003	1.00124	0.303	0.583

The p-value, 0.583, was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

2) Primary Nurses

3) Secondary Nurses

Similarly to the regressions of the health work income including private practice income, all three models: Model 1 to 3 in cases in primary and secondary nurses failed to obtain the statistical significance for F-value of the equation and the coefficients of variable entered (Table 7.32 to 7.33). Because the results were without statistical significance, the results of regressions were shown only in tables. However, a noticeable point was that a result of regression and that of descriptive statistical analysis of the total household income of secondary nurses disagreed. As note in Table 7.33, a health worker's (Ln) total household income was 31.0% ($p > 0.1$) higher than a comparable health worker's (LN) income in MODs, controlling for all other variables. However, the mean income was lower in CODs than in MODs (Table 7-1-1).

Table 7.32: Result of regressions of (Ln) total household income [Model 1] (Primary nurses, N = 117)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.225	0.196	1.147	0.254	0.003	329.235
Age Squared	-0.003	0.002	-1.219	0.226	0.003	327.949
Male	0.120	0.224	0.537	0.592	0.642	1.559
COD	0.233	0.167	1.397	0.165	0.782	1.278
Married	0.105	0.329	0.318	0.751	0.641	1.561
Economic Status*	-0.037	0.218	-0.169	0.866	0.773	1.294
Constant	2.588	4.431	0.584	0.560		
Prob. >F	0.395					
R-square	0.054					
R-square adjusted	0.003					
Root MSE	0.797					
AIC	-46.338					

*p < 0.1
**p < 0.05
***p < 0.01

Table 7.33: Result of regressions of (Ln) total household income [Model 1] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.150	0.124	1.212	0.231	0.011	90.253
Age Squared	-0.002	0.001	-1.164	0.249	0.012	84.968
Male	0.367	0.390	0.942	0.350	0.777	1.287
COD	0.225	0.240	0.941	0.351	0.760	1.316
Married	0.032	0.474	0.067	0.947	0.527	1.898
Economic Status*	-0.132	0.227	-0.579	0.565	0.732	1.366
Constant	4.328	2.387	1.813	0.075		
Prob. >F	0.626					
R-square	0.071					
R-square adjusted	-0.026					
Root MSE	0.738					
AIC	-32.277					

*p < 0.1
**p < 0.05
***p < 0.01

4) Midwives

This model excluded the dummy variables for cadre and for females. As seen in Table 7.34 in this model, controlling for all other variables, a midwife's (Ln) total household income in CODs was on average 61.4% ($p < 0.01$) higher than a comparable midwife's (Ln) total household income in MODs. After exponetiating the coefficient, the total household income of a midwife in CODs was on average 84.8% ($p < 0.01$) above the income of a comparable midwife in MODs. The coefficient for the variable was only one variable which was statistically significant ($p < 0.05$) in this model (Table 7.34).

Plotting of residuals presented approximate homoscedasticity (Figure 7.23). This feature was consistent with the result of the modified White test below which did not indicate heteroscedasticity.

Table 7.34: Result of regressions of (Ln) total household income [Model 1] (Midwives, N = 61)

	Coefficient	Std. Error	t	P > t		Tolerance	VIF
Age	-0.118	0.085	-1.387	0.171		0.009	115.699
Age Squared	0.001	0.001	1.223	0.227		0.009	115.676
COD	0.614	0.154	3.985	0.000	***	0.696	1.437
Married	0.190	0.156	1.222	0.227		0.665	1.503
Economic Status*	0.153	0.153	0.996	0.324		0.632	1.583
Constant	9.417	1.783	5.283	0.000			
Prob. > F	0.000						
R-square	0.340						
R-square adjusted	0.280						
Root MSE	0.465						
AIC	-87.666						

*p < 0.1
**p < 0.05
***p < 0.01

Cook's distance: 0.150 < 0.5

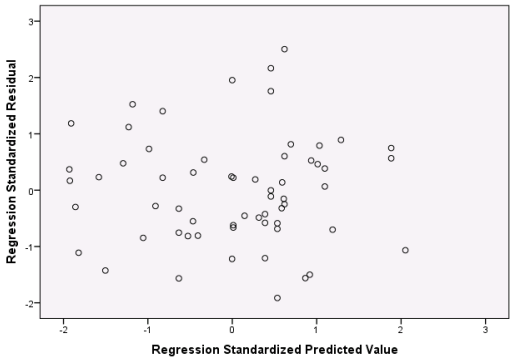


Figure 7.23: Scatter plot of residuals (dependent variable: Ln Total household income) [Model 1] (midwives, N = 61)

The modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.002	-0.015	0.27574	0.128	0.712

The p-value, 0.712 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

(2) Group A Model 2

1) All health workers

In this model as shown in Table 7.35, no coefficients were statistically significant ($p < 0.05$). Controlling for all other variables, a health worker's (Ln) total household income in CODs was on average 20.5% ($p > 0.1$) higher than a comparable health worker's (Ln) total household income in MODs. After exponetiating the coefficient, the total household income of a heath worker in CODs was on average 22.8% ($p < 0.01$) above the income of a comparable a heath worker in MODs (Table 7.35).

Table 7. 35: Result of regressions of (Ln) total household income [Model 2] (All health workers, N = 250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.212	0.130	1.625	0.105		0.621	1.610
Primary MW	-0.309	0.170	-1.820	0.070	*	0.488	2.050
Secondary MW	0.177	0.218	0.811	0.418		0.629	1.590
Assistant Doctor	-0.334	0.341	-0.979	0.328		0.880	1.136
Doctor	0.624	0.420	1.487	0.138		0.960	1.041
Age	0.113	0.064	1.763	0.079	*	0.008	124.928
Age Squared	-0.001	0.001	-1.860	0.064	*	0.008	122.998
Male	0.160	0.161	0.994	0.321		0.333	3.000
Married	0.143	0.152	0.941	0.348		0.704	1.419
COD	0.205	0.165	1.245	0.214		0.315	3.178
Prohibition dual practice Mid**	0.008	0.126	0.061	0.951		0.634	1.577
Prohibition dual practice Low***	-0.122	0.177	-0.690	0.491		0.257	3.884
Constant	5.037	1.366	3.686	0.000			
Prob. >F	0.000						
R-square	0.166						
R-square adjusted	0.124						
Root MSE	0.708						
AIC	-159.875						
*p < 0.1							
**p < 0.05							
***p < 0.01							

2) Primary nurses

3) Secondary Nurses

All three models: Model 1 to 3 in cases in primary and secondary nurses, failed to obtain statistical significance for F-value of the equation and the coefficients of the variable entered (Table 7.36, 7.37). Because of the results without the statistical significance, the results of regressions were only shown in tables. If noticeable points were found, they are described.

A noticeable point was that a result of regression and that of descriptive statistical analysis of the total household income of secondary nurses disagreed. As note in Table 7.37, a secondary worker's (Ln) total household income in CODs was higher than a comparable secondary nurse's (LN) income in MODs, controlling for all other variables. However, the mean income was lower in CODs than in MODs (Table 7-1-2).

Table 7.36: Result of regressions of (Ln) total household income [Model 2] (Primary nurses, N = 117)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.244	0.199	1.225	0.223	0.003	336.368
Age Squared	-0.003	0.002	-1.299	0.197	0.003	336.052
Male	0.151	0.230	0.657	0.513	0.614	1.630
Married	0.093	0.331	0.280	0.780	0.639	1.566
COD	0.130	0.233	0.560	0.576	0.405	2.469
Prohibition dual practice Mid**	-0.028	0.241	-0.115	0.908	0.636	1.573
Prohibition dual practice Low***	-0.171	0.268	-0.637	0.526	0.318	3.147
Constant	2.325	4.423	0.526	0.600		
Prob. >F	0.467					
R-square	0.058					
R-square adjusted	-0.003					
Root MSE	0.799					
AIC	-44.773					
*p < 0.1						
**p < 0.05						
***p < 0.01						

Table 7.37: Result of regressions of (Ln) total household income [Model 2] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.147	0.128	1.154	0.253	0.011	94.203
Age Squared	-0.002	0.002	-1.104	0.274	0.011	89.003
Male	0.361	0.398	0.908	0.368	0.760	1.316
Married	0.043	0.490	0.088	0.930	0.502	1.994
COD	0.258	0.387	0.666	0.508	0.296	3.374
Prohibition dual practice Mid**	0.139	0.240	0.580	0.564	0.669	1.495
Prohibition dual practice Low***	0.041	0.388	0.107	0.915	0.256	3.912
Constant	4.204	2.446	1.719	0.091		
Prob. >F	0.739					
R-square	0.072					
R-square adjusted	-0.044					
Root MSE	0.745					
AIC	-30.290					
*p < 0.1						
**p < 0.05						
***p < 0.01						

4) Midwives

No coefficients were statistically significant in this model. However, As seen in Table 7.38, in this model, controlling for all other variables, a midwife's (Ln) income total household income in CODs was on average 37.2% (p > 0.1) higher than a comparable midwife' (Ln) total household income in MODs. After exponetiating the coefficient, the income of a midwife in CODs was on average 45.1 % (p> 0.1) above the income of a comparable midwife in MODs (Table 7.38).

Table 7.38 : Result of regressions of (Ln) total household income [Model 2] (Midwives, N = 61)

	Coefficient	Std. Error	t	P > t	Tolerance	VIF
Age	-0.117	0.086	-1.364	0.178	0.009	115.762
Age Squared	0.001	0.001	1.202	0.235	0.009	115.727
Married	0.167	0.159	1.048	0.299	0.641	1.561
COD	0.372	0.357	1.042	0.302	0.131	7.652
Prohibition dual practice Mid**	-0.175	0.157	-1.118	0.269	0.609	1.643
Prohibition dual practice Low***	-0.272	0.361	-0.753	0.455	0.122	8.213
Constant	9.821	1.840	5.336	0.000		
Prob. > F	0.001					
R-square	0.347					
R-square adjusted	0.274					
Root MSE	0.467					
AIC	-86.303					

*p < 0.1
**p < 0.05
***p < 0.01

(3) Group B Model 3

1) All health workers

As seen in Table 7.39 in this model, controlling for all other variables, a health worker's (Ln) total household income in Peareang was on average 37.1% (p < 0.01) higher than a comparable health worker's (Ln) total household income in Kamchay Mea. After exponetiating the coefficient, the income of a health worker in Peareang was on average 44.9% (p < 0.01) above the income of a comparable health worker in Kamchaly Mea. The coefficient was one of the two variable with statistical significance (p > 0.05) (Table 7.39). This higher income in Peareang was consistent with the result of descriptive statistical analyses (Table 7-1-3).

Controlling for all other variables, a health worker's (Ln) total household income in Kirivong was on average 37.9% ($p < 0.01$) higher than a comparable health worker's (Ln) total household income in Kamchay Mea. After exponetiating the coefficient, the income from health work including private practice of a health worker in Kirivong was on average 46.1% ($p < 0.01$) above the income of a comparable health worker in Kamchaly Mea.

The higher income in Kirivong was not consistent with the result of descriptive statistical analyses (Table 7-1-3).

The plot of the residual appeared not to show heteroscedasticity (Figure 7.24). This feature was consistent with the result of modified White test below which did indicated hetroscedasticity. Outlier cases in the plot were not extreme according to the statistics of Cook's distance (Table 7.39).

Table 7.39: Result of regressions of (Ln) total household income [Model 3] (All health workers, N = 250)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Secondary NS	0.225	0.132	1.707	0.089	*	0.607	1.646
Primary MW	-0.326	0.172	-1.898	0.059	*	0.478	2.093
Secondary MW	0.171	0.219	0.782	0.435		0.628	1.592
Assistant Doctor	-0.314	0.343	-0.918	0.360		0.874	1.144
Doctor	0.665	0.424	1.567	0.118		0.942	1.062
Age	0.110	0.065	1.709	0.089	*	0.008	125.549
Age Squared	-0.001	0.001	-1.794	0.074	*	0.008	123.865
Male	0.144	0.163	0.881	0.379		0.326	3.066
Married	0.149	0.152	0.975	0.331		0.702	1.423
Mesang	0.105	0.153	0.684	0.495		0.616	1.624
Peareng	0.371	0.135	2.753	0.006	***	0.582	1.718
Preah Sdach	0.254	0.180	1.413	0.159		0.717	1.394
Kirivong	0.379	0.136	2.793	0.006	***	0.551	1.815
Constant	4.926	1.370	3.597	0.000			
Prob. >F	0.000						
R-square	0.167						
R-square adjusted	0.122						
Root MSE	0.709						
AIC	-158.370						
*p < 0.1							
**p < 0.05							
***p < 0.01							

Cook's distance: 0.193 < 0.5

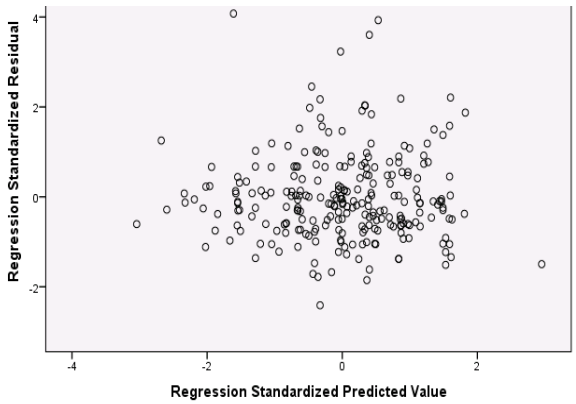


Figure 7.24: Scatter plot of residuals (dependent variable: Ln Total household income) [Model 3] (All health workers, N=250)

Modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.001	-0.003	1.00112	0.358	0.550

The p-value, 0.550 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is no heteroscedasticity in the model.

2) Primary nurses

3) Secondary Nurses

This regression model in cases in both primary nurses and secondary nurses failed to obtain statistical significance ($p < 0.05$) for their F-values and coefficients.

Table 7.40 : Result of regressions of (Ln) total household income [Model 3] (Primary nurses, N = 117)

	Coefficient	Standard Error	t	P > t		Tolerance	VIF
Age	0.221	0.201	1.100	0.274		0.003	341.840
Age Squared	-0.003	0.002	-1.164	0.247		0.003	342.453
Male	0.111	0.235	0.472	0.638		0.591	1.692
Married	0.096	0.331	0.290	0.772		0.639	1.566
Mesang	0.202	0.226	0.895	0.373		0.619	1.616
Peareng	0.386	0.220	1.754	0.082	*	0.670	1.492
Preah Sdach	0.238	0.262	0.907	0.366		0.675	1.480
Kirivong	0.363	0.236	1.540	0.127		0.668	1.497
Constant	2.552	4.478	0.570	0.570			
Prob. >F	0.491						
R-square	0.065						
R-square adjusted	-0.004						
Root MSE	0.800						
AIC	-43.637						

*p < 0.1
**p < 0.05
***p < 0.01

Table 7.41 : Result of regressions of total household income [Model 3] (Secondary nurses, N = 64)

	Coefficient	Standard Error	t	P > t	Tolerance	VIF
Age	0.147	0.129	1.142	0.258	0.011	94.227
Age Squared	-0.002	0.002	-1.093	0.279	0.011	89.035
Male	0.361	0.401	0.900	0.372	0.760	1.316
Married	0.043	0.494	0.088	0.930	0.502	1.994
Mesang	0.035	0.430	0.082	0.935	0.815	1.227
Peareng	0.224	0.277	0.810	0.421	0.535	1.868
Preah Sdach	0.266	0.403	0.659	0.512	0.752	1.329
Kirivong	0.363	0.284	1.281	0.206	0.486	2.059
Constant	4.241	2.512	1.688	0.097		
Prob. >F	0.827					
R-square	0.072					
R-square adjusted	-0.063					
Root MSE	0.751					
AIC	-28.298					

*p < 0.1
**p < 0.05
***p < 0.01

4) Midwives

As seen in Table 7.42, controlling for all other variables, a midwife's (Ln) total household income in Peareang was on average 64.8% (p < 0.01) higher than a comparable midwife's

(Ln) total household income in Kamchay Mea. After exponetiating the coefficient, the income from health work including private practice of a midwife's in Peareang was on average 91.8% ($p < 0.01$) above the income of a comparable midwife's in Kamchaly Mea.

Controlling for all other variables, a midwife's (Ln) total household income in Kirivong was on average 47.3% ($p < 0.05$) higher than a comparable midwife's (Ln) total household income in Kamchay Mea. After exponetiating the coefficient, the income of a midwife's in Kirivong was on average 60.48% ($p < 0.05$) above the income of a comparable midwife's in Kamchaly Mea (Table 7.42). This higher income in Peareang was consistent with the result of descriptive statistical analyses (Table 7-1-3).

This higher income in Peareang and Kirivong were consistent with the result of descriptive statistical analyses (Table 7-1-3).These two coefficients were only two coefficients which obtained with statistical significance ($p > 0.05$) (Table 7.42).

The plot of the residual appeared not to show heteroscedasticity (Figure 7.25). This feature was consistent with the result of modified White test below which did not indicated hetroscedasticity. Outlier cases in the plot were not extreme according to the statistics of Cook's distance (Table 7.42).

Table 7.42 : Result of regressions of (Ln) total household income [Model 3] (Midwives, N = 61)

	Coefficient	Std. Error	t	P > t		Tolerance	VIF
Age	-0.117	0.088	-1.340	0.186		0.008	118.618
Age Squared	0.001	0.001	1.180	0.243		0.008	118.876
Married	0.167	0.161	1.039	0.304		0.639	1.564
Mesang	0.007	0.228	0.033	0.974		0.445	2.248
Peareng	0.648	0.216	2.996	0.004	***	0.402	2.487
Preah Sdach	0.377	0.389	0.970	0.337		0.761	1.314
Kirivong	0.473	0.207	2.287	0.026	**	0.357	2.801
Constant	9.553	1.831	5.217	0.000			
Prob. > F	0.001						
R-square	0.347						
R-square adjusted	0.261						
Root MSE	0.471						
AIC	-84.304						
*p < 0.1							
**p < 0.05							
***p < 0.01							

The Cook's distance: 0.484 < 0.5

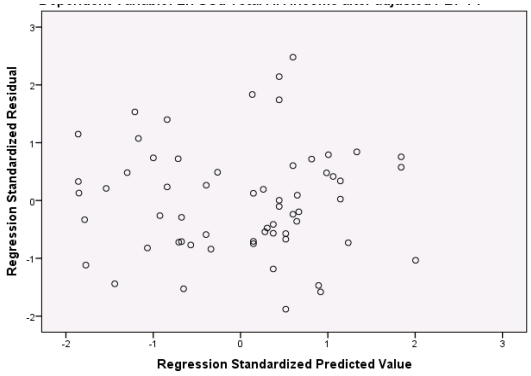


Figure 7.25: Scatter plot of residuals (dependent variable: Ln Total household income) [Model 3] (midwives, N = 61 (Model 3)

The modified White test result

R-square	Adjusted R-square	S. E.	F-value	P-value
0.002	-0.015	0.27366	0.115	0.736

The p-value, 0.736 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected ; there is homoscedasticity in the model.

(4) Conclusion for results of income regressions

The regressions of the incomes of health workers and their households showed that these incomes were higher in CODs than in MODs with statistical significance in most of the models. The higher incomes were supported by sufficient percentage differences from the incomes in MODs. This confirms the high impact of payment associated with the contracting settings, implying that the higher income in the government sector in CODs raised the income from health work including private practice and the total household income.

The variable, COD, obtained positive coefficients with statistical significance in most regression models of these different types of income. The variables for three individual Operational Districts: Peareang, Preah Sdach and Kirivong, compared with Kamchay Mea, an MOD, again obtained higher positive coefficients, with statistical significance, in most of the regression models of different types of income. Regressions of the cases for all health workers presented reasonably strong evidence for the higher income. Regressions of the cases by cadre also presented reasonably convincing evidence, with regressions of midwife cases resulting in strong evidence. These findings were consistent with results from

descriptive statistical analyses (Table 7-1-1 to 7-1-4).

7.3.4 Total household expenditure

(1) Group A Model 1

Prior to multivariate regressions, using the logged total household expenditure, univariate regressions applying each independent variable were undertaken in order to test the R-squares for the variables, other statistics including p-value for the model (Table 7.43) and p-value of the independent variable. Each row of the table shows the regression result. Checking by the criteria noted in Chapter 4 (4.3.3 (8) d), it was found that a regression with Economic Status obtained p-value of 0.308. However, it was kept as an independent variable, due to the importance to the theoretical hypothesis concerning the contribution to the total household expenditure (Table 7.43).

Table 7.43 Result of univariate regressions of (Ln) total household expenditure with variables in order from the highest R-square

	R	R Square	Adjusted R Square	S.E.	Sig.(model)
Household size	0.320	0.103	0.099	0.434	0.000
COD	0.181	0.033	0.029	0.459	0.004
Male	0.170	0.029	0.025	0.460	0.070
Cadre	0.210	0.044	0.025	0.490	0.049
Age	0.113	0.013	0.009	0.464	0.075
5ODs	0.183	0.033	0.018	0.463	0.079
Married	0.179	0.032	0.028	0.460	0.005
Prohibition of Private Practice	0.143	0.021	0.006	0.463	0.077
Economic Status	0.065	0.040	0.0002		0.124
Age, Age Squ	0.190	0.036	0.003	0.460	0.308

S.E. :Standard Error of the Estimate

As seen in Table 7.44, controlling for all other variables, a health work's (Ln) total household expenditure in CODs was on average 18.6% ($p < 0.01$) higher than a comparable health work's (Ln) total household expenditure in MODs. After exponetiating the coefficient, the expenditure of a health work in CODs was on average 20.4% ($p < 0.01$) above the expenditure of a comparable health work in MODs.

Controlling for all other variables, a health worker's one-year increase in age resulted in a 9.8% ($p <0.05$) increase in (Ln) total household expenditure than a comparable health worker's (Ln) total household expenditure. After exponetiating the coefficient, one-year increase in age raised the household expenditure on average by 10.3% ($p <0.05$) above the expenditure total household expenditure in the health worker's previous age.

Controlling for all other variables, a one person increase in the membership of a household of a health worker brought about 8.0% ($p < 0.01$) higher (Ln) total household expenditure. After exponetiating the coefficient, a one person increase in the membership of a household of a health worker brought about 8.3.% ($p < 0.01$) higher total household expenditure.

The plot of the residual appeared not to show heteroscedasticity (Figure 7.25). This feature was consistent with the result of modified White test below which did not indicated hetroscedasticity. Outlier cases in the plot were not extreme according to the statistics of Cook's (Cook's distance: $0.204 < 0.5$).

(2) Group A Model 2

As seen in Table 7.45, controlling for all other variables, a health work's (Ln) total household expenditure in CODs was on average 16.6% ($p < 0.1$) higher than a comparable health work's (Ln) total household expenditure in MODs. After exponetiating the coefficient, the expenditure of a health work in CODs was on average 18.1% ($p < 0.1$) above the expenditure of a comparable health work in MODs.

Controlling for all other variables, a health worker's one-year increase in age resulted in a 9.9% ($p < 0.05$) increase in (Ln) total household expenditure than a comparable health worker's (Ln) total household expenditure. After exponetiating the coefficient, one-year increase in age raised the household expenditure on average by 10.4% ($p < 0.05$).

Controlling for all other variables, a one person increase in the membership of a household of a health worker brought about 8.0% ($p < 0.01$) higher (Ln) total household expenditure.

After exponetiating the coefficient, a one person increase in the membership health worker brought about 8.3.% ($p < 0.01$) higher total household expenditure.

The plot of the residual appeared not to show heteroscedasticity (Figure 7.26). This feature was consistent with the result of modified White test below which did not indicated hetroscedasticity. Outlier cases in the plot were not extreme according to the statistics of Cook's (Cook's distance: $0.191 < 0.5$).

Table 7.44: Result of regression analyses of (Ln) total household expenditure (Group A Model 1)

Group A Model 1								Group A Model 2						
	B	S. E.	Beta	t	Sig.	Tolerance	VIF	B	S. E.	Beta	t	Sig.	Tolerance	VIF
HHSize	0.080	0.020	0.254	4.068	0.000	0.843	1.187	0.080	0.020	0.254	4.061	0.000	0.843	1.187
Secondary NS	0.168	0.077	0.157	2.189	0.030	0.637	1.569	0.164	0.078	0.154	2.111	0.036	0.620	1.613
Primary MWs	0.097	0.102	0.078	0.951	0.343	0.485	2.063	0.096	0.102	0.078	0.945	0.345	0.485	2.064
Secondary MW	0.167	0.130	0.093	1.286	0.200	0.630	1.588	0.169	0.130	0.094	1.293	0.197	0.629	1.591
Assit. Doctro	-0.328	0.203	-0.099	-1.612	0.108	0.878	1.139	-0.330	0.204	-.099	-1.619	0.107	0.876	1.141
Doctor	0.347	0.250	0.081	1.389	0.166	0.961	1.040	0.342	0.251	0.080	1.360	0.175	0.955	1.047
Age	0.098	0.039	1.635	2.525	0.012	0.008	127.623	0.099	0.039	1.650	2.534	0.012	0.008	128.578
AgeSqu	-0.001	0.000	-1.528	-2.389	0.018	0.008	124.512	-0.001	0.000	-1.545	-2.399	0.017	0.008	125.744
Male	0.157	0.095	0.163	1.656	0.099	0.340	2.938	0.162	0.097	0.168	1.673	0.096	0.327	3.056
Married	.074	.090	.056	.818	.414	0.708	1.413	0.071	0.091	0.053	0.777	0.438	0.697	1.435
COD	0.186	0.064	0.194	2.924	0.004	0.747	1.338	0.166	0.098	0.173	1.692	0.092	0.315	3.178
Economic status < Kirivong	-0.015	0.071	-0.014	-0.208	0.836	0.713	1.403	-	-	-	-	-	-	-
ProhibitionDPMid	-	-	-	-	-	-	-	0.008	0.076	0.008	0.105	0.916	0.631	1.585
ProhibitionDPMOH	-	-	-	-	-	-	-	-0.028	0.105	-0.030	-0.266	0.791	0.257	3.884
(Constant)	5.176	0.809		6.401	0.000			5.173	0.818		6.322	0.000		
Prob > F	0.000							0.000						
R-squared	0.221							0.222						
Adjusted R-squared	0.182							0.179						
Root MSE	0.422							0.422						
AIC	-419.143							-417.218						

Table 7.45: Result of regression analyses of (Ln) total household expenditure (Group A Model 2)

Model 1: Cook's distance 0.204 < 0.5.

Model 2 Cook's distance 0.191 < 0.5

VIF :Variation-inflaton factors, an indicator of multicollinearity used commonly (Ensor et al. 2009)

Heterocedasticity in the model 1 was checked by the plotting (Figure 7.26). This plot also appeared to indicate homoscedasticity.

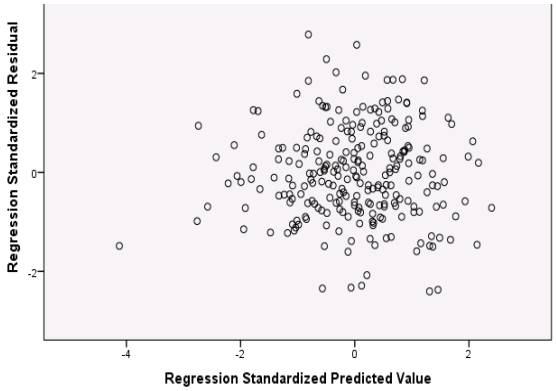


Figure 7.26: Scatter plot of residuals (dependent variable: Ln Total household expenditure) [Model 1](All health workers, N=250)

Result of modified White test

R-square	Adjusted R-square	S. E.	F-value	P-value
0.030	-0.001	0.25968	0.870	0.352

The p-value, 0.352 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

Heterocedasticity in the model 2 was checked by the plotting (Figure 7.27). The plot appeared to show homoscedasticity.

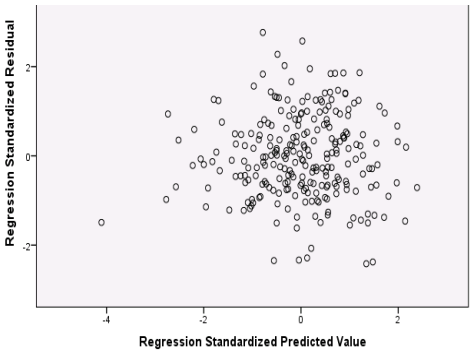


Figure 7.27: Scatter plot of residuals (dependent variable: Ln Total household expenditure) [Model 2](All health workers, N=250)

Result of modified White test

R-square	Adjusted R-square	S. E.	F-value	P-value
0.003	-0.001	0.26133	0.852	0.357

The p-value, 0.357 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was not rejected; there is homoscedasticity in the model.

(3) Group B Model 3

As seen in Table 7.46, in this model, controlling for all other variables, a health worker's (Ln) total household expenditure in Kirivong was on average 19.7% ($p < 0.05$) higher than a comparable health worker's (Ln) the expenditure in Kamchay Mea (the variable for Kamchay Mea was the reference variable). After exponetiating the coefficient, the expenditure of a health worker in Kirivong was on average 21.8% ($p < 0.05$) above the expenditure of a comparable health worker in Kamchay Mea

Controlling for all other variables, a health worker's (Ln) expenditure in Peareang was on average 18.9% ($p < 0.05$) higher than a comparable health worker's (Ln) expenditure in Kamchay Mea. After exponetiating the coefficient, the expenditure of a health worker in Peareang was on average 20.8% ($p < 0.05$) above expenditure comparable health worker in Kamchay Mea.

Controlling for all other variables, a secondary nurse's (Ln) expenditure was 16.3% ($p < 0.01$) was higher than a comparable primary nurse's (Ln) expenditure (the variable for primary nurse was the reference variable). After exponetiating the coefficient, the expenditure of a secondary nurse was on average 17.7% ($p < 0.01$) above the expendiuturee of a comparable primary nurse.

The higher expenditures were consistent with the result of the descriptive statistical analysis about the means of expenditures in these Operational Districts, despite that the orders from the highest about the percentage differences and about the means. However, the order of these percentage differences was different from the order of the mean which was from the highest to lowest (Table 7-1-4).

Controlling for all other variables, a health worker's one-year increase in age resulted in a 9.8% ($p <0.05$) increase in (Ln) total household expenditure than a comparable health worker's (Ln) total household expenditure. After exponetiating the coefficient, one-year increase in age raised the household expenditure on average by 10.3% ($p <0.05$) above the expenditure total household expenditure in the health worker's previous age.

Controlling for all other variables, a one person increase in the membership of a household of a health worker brought about 8.0% ($p < 0.01$) higher (Ln) total household expenditure. After exponetiating the coefficient, a one person increase in the membership of a household of a health worker brought about 8.3.% ($p < 0.01$) higher total household expenditure.

Table 7.46: Result of regression analysis of (Ln)total household expenditure Result of regressions of total household income [Model 3] (All health workers, N = 250)

	Coefficient	S. E.	S. Coefficients	t	Sig.		Tolerance	VIF
HHSize	0.080	0.020	0.254	4.036	0.000	***	0.839	1.191
Secondary NS	0.163	0.079	0.152	2.062	0.040	**	0.606	1.650
Primary MW	0.098	0.103	0.080	0.953	0.342		0.474	2.110
Secondary MW	0.169	0.131	0.094	1.295	0.197		0.628	1.593
Ass.Doctor	-0.332	0.205	-0.100	-1.621	0.106		0.870	1.150
Doctor	0.337	0.254	0.079	1.324	0.187		0.935	1.069
Mesang	-0.012	0.091	-0.010	-0.134	0.894		0.613	1.630
Peareang	0.189	0.080	0.178	2.353	0.019	**	0.581	1.720
Preah Sdach	0.161	0.107	0.102	1.497	0.136		0.717	1.395
Kirivong	0.197	0.081	0.189	2.432	0.016	**	0.550	1.817
Age	0.099	0.039	1.657	2.531	0.012	**	0.008	129.401
AgeSqu	-0.001	0.000	-1.553	-2.396	0.017	**	0.008	126.816
Male	0.164	0.098	0.170	1.670	0.096	*	0.319	3.130
Married	0.070	0.091	0.053	0.768	0.443		0.695	1.438
(Constant)	5.143	0.821		6.263	0.000			
Prob. >F	0.000							
R-square	.222							
R-square adjuste	.175							
Root MSE	.222							
AIC	-415.237							
*p <0.1								
**p<0.05								
***p < 0.01								

Cook's distance 0.177

The higher total household expenditures in the thress CODs were highly likely to have been associated with the contracting settings; the magnitude of the payments associated with the contractings seemed to contribute to the higher expenditure. The result of descriptive statistical analysis strongly supports the high magnitude.

Heterocedasticity in the model was checked by the plotting (Figure 7.28). The plot appeared to show homoscedasticity.

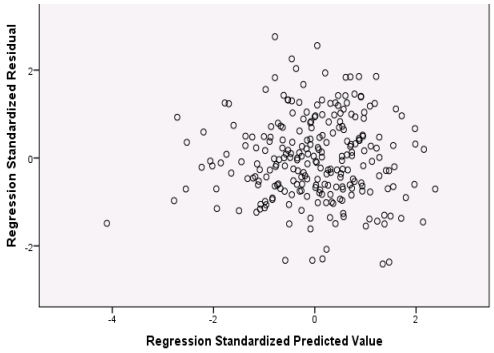


Figure 7.28: Scatter plot of residuals (dependent variable: Ln Total household expenditure) [Model 3](All health workers, N=250)

Result of modified White test

R-square	Adjusted R-square	S. E.	F-value	P-value
0.003	-0.001	0.26114	0.868	0.352

The p-value, 0.352 was insignificant ($p > 0.05$), therefore, the H_0, the null assumption hypothesis was accepted; there is no heterocedasticity in the model.

(4) Conclusion for results of expenditure regressions

The regressions of the total household expenditures additionally confirm the higher expenditure of health workers' households in CODs. The higher expenditure was likely to have been brought about by the payments associated with the contracting settings. The higher expenditures were consistent with the higher means of expenditure in CODs than in MODs in the results of descriptive statistical analyses.

7.4 Conclusion

The result of regression analyses above confirms higher incomes and total household expenditures in CODs as a group (Modle 1 and 2) or the three individual CODs (Model 3), compared with MODs as a group or Kamchay mea, an MOD, used as the reference variable (the summary is shown in Table7.47-1, -2). The higher incomes were highly likely to have been brought about by the contracting payments associated with the contracting settings. The magnitude of the payments associated with the contracting settings, which was reflected in the coefficients of variables, seems to be reasonably high.

The result of descriptive statistical analysis (Chpater 6 and Table 7-1-1 to 7-1-4) strongly supports the high magnitude. Therefore, it is concluded that payments associated with the contracting settings were highly likely to have contributed to increasing the incomes. Also, the higher incomes in CODs suggested increases in labour supply in the government sector and brought about labour transfer from the private sector to the government sector.

Table 7.47-1 Summary of regression analyses for variables expressing CODs and individual CODs

1 Income from health work excluding private practicce

Cases	All workers		Primary nurses		Secondary nurses		Midwives	
Variable for CODs	COD	Equation's F-value	COD	Equation's F-value	COD	Equation's F-value	COD	Equation's F-value
Group A Model 1	(P < 0.01)	***	(P < 0.01)	***	(P < 0.01)	***	(P < 0.01)	***
Group A Model 2	(P < 0.01)	***	(P < 0.01)	***	(P < 0.01)	***	(P < 0.05)	***
Variable for individual CODs	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value
Group B Model 3	All (P < 0.01)	***	All (P < 0.01)	***	All (P < 0.01)	***	PG (P < 0.01), PS (P < 0.05), KV (P < 0.01),	***

2 Income from health work including private practice

Cases	All workers		Primary nurses		Secondary nurses		Midwives	
Variable for CODs	COD	Equation's F-value	COD	Equation's F-value	COD	Equation's F-value	COD	Equation's F-value
Group A Model 1	(P < 0.01)	***	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P > 0.01)	***
Group A Model 2	(P < 0.1)	***	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P > 0.1)	***
Variable for individual CODs	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value
Group B Model 3	PG (P < 0.05), PS (P < 0.05) ,KV (P < 0.01),	***	PG (P > 0.1), PS (P > 0.1), KV (P < 0.1)	(P > 0.1)	All (P > 0.1)	(P > 0.1)	PG (P < 0.05), PS (P > 0.1), KV (P < 0.01)	***

Cases: All N=250, Primary nurses N=117, Secondary nurses N=64, Midwives =61. Group B Model 3: All = Peareng, Prea Sdach, and Krivong Operational Districts PG: Peareng, PS: Prea Sdach, KV: Krivong

***P < 0.01, ** P <0.05, * P<0.1

Table 7.47-2 Summary of regression analyses

3 Total household income

Cases	All workers		Primary nurses		Secondary nurses		Midwives	
Variable for individual CODs	COD	Equation's F-value	COD	Equation's F-value	COD	Equation's F-value	COD	Equation's F-value
Group A Model 1	(P < 0.01)	***	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P < 0.01)	***
Group A Model 2	(P > 0.1)	***	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P > 0.1)	(P > 0.1)	***
Variable for individual CODs	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value	Peareng, Preah Sdach, Krivong	Equation's F-value
Group B Model 3	PG (P < 0.01), PS (P > 0.1), KV (P < 0.01)	***	PG (P < 0.1), PS (P > 0.1), KV (P > 0.1)	(P > 0.1)	All (P > 0.1)	(P > 0.1)	PG(P < 0.01), PS (P > 0.1), KV (P < 0.05)	***

4 Total household Expenditure

Cases	All workers	
Variable for individual CODs	COD	Equation's F-value
Group A Model 1	(P < 0.01)	***
Group A Model 2	(P < 0.1)	***
Variable for individual CODs	Peareng, Preah Sdach, Krivong	Equation's F-value
Group B Model 3	PG (P < 0.05), PS (P > 0.1), KV (P < 0.05)	***

Cases: All N=250, Primary nurses N=117, Secondary nurses N=64, Midwives =61. Group B Model 3: All = Peareng, Prea Sdach, and Krivong Operational Districts PG: Peareng, PS: Prea Sdach, KV: Krivong

***P < 0.01, ** P <0.05, * P<0.1

Chapter 8 Discussion

8.1 Introduction

First this chapter discusses the qualitative evidence concerning dual practice before implementation of the payments associated with the contracting setting. This qualitative evidence supports the prevalence of dual practice before the implementation of payments, compensating for the lack of base-line data of income from the private practice in this study. Second,

the evidence for a potential reduction in dual practice income in the intervention areas is assessed. In the third section, the intervention areas and varying effects are discussed.

The section focuses more exclusively on the effect on secondary nurses in different CODs, and illuminates more generally the implementation at the subcontractor level. The final section focuses on the methodological contribution of the mixed methods approach and finishes with a brief review of the Theory of Change.

The discussion draws on the findings arising from the mixed-methods of this study which applied a sequential design (Creswell et.al 2011b; Bryman 2006), beginning with a qualitative investigation of key informants with experience of the contracting project, such as the NGO Contract managers. The qualitative interviews highlighted the extent of the private practice engaged by government health workers and the different institutional rules and mechanisms developed by contractors to prohibit the practice, and the allocation of performance-related payments in each of the three districts. This was followed by a quantitative household survey of 250 government health worker households, which described and compared government health workers' and their household incomes and expenditures between CODs and MODs and among the five Operational Districts. A mini-survey was also undertaken to investigate the payment allocation methods at the subcontractor level that contributed to the varying incentive environments at the micro-level. Then, the regression analyses which followed descriptive statistical analyses of household survey data contributed to exploring the impact of payments associated with the contracting settings.

8.2 Dual practice before implementation of payments

It was earlier noted that, increasingly, performance-based payments have been included as part of the contracting out of government health services in LMICs and post-conflict fragile states (Carlson et al. 2005) The main argument for their promotion by donor agencies and International Finance Institutions, such as the World Bank, was their perceived potential to

increase service delivery by changing the incentive environment in local health systems. The main difficulties which affected health service delivery in this environment were identified as:

1) The public sector characteristics of incentive and institutional arrangements (Belsey and Ghatak 2003; Soch and Beek 2011), including low government salaries (Soeters and Griffiths 2003), appeared to influence the effect of payments.

2) Pervasive dual practice private practice income had significant implications for the effectiveness of service delivery (Soeter and Griffiths 2003; Akashi et al. 2002), but

3) Regulating dual practice was facing persistent difficulties (González 2004).

Low government regular payments in both CODs and MODs found by this study were in accord with the findings of the MOH incentive study (1995), and it was widely recognised by the NGO contractors that reducing the private practice of health workers would be difficult in this environment. However, what remained unclear was whether the performance-based payments would offer a sufficient impact on the health workers' individual and household incomes that would reduce their participation in dual practice while increasing their labour supply to public service delivery; this is discussed in the next section (8.3). One of the difficulties in determining this in the current study was the extent and degree of private practice pursued by the health workers surveyed. With an absence of base-line data, the study relied on the evidence from the qualitative interviews for the prevalence of private practice.

Key informant interviews indicated that private practice was routinely practiced by the government health workers, who themselves did not perceive any wrongdoing, with workshops provided at the start of the project explaining why:

"… dual practice is still conducted. They (health workers) do not understand what sorts of practices are regarded as private practice. …They do not understand private practice conducted by their family is wrong." (KI01, 17 March 2006)

"…we had workshops for making them understand, and that it included prohibition of private practice" (KI02, Jul.9, 2007)

Key informants' perceptions about dual practice also suggested the high prevalence and even the necessity for dual practice: "*They (health workers working for Operational Districts contracted out) need time to go to outside (their health facility for private practice), get outside for feeding their family*." (KI 11, August 4, 2006).

One NGO Contractor acknowledged the importance of private practice income to the health workers and their dependence on alternative sources income, given the fact that the level of performance-based payments might fluctuate:

"(*We do not prohibit private practice completely), because payments to them are performance-related payments, the amount of salaries are not assured all time, so that alternative income resources to sustain a certain level of income is necessary* (KI04, 22 Apr. 2005).

At the beginning of the DFID/World Bank contracting project in 2004, it would also be reasonable to assume that dual practice was widely recognised as prevalent and negatively affecting health service delivery interventions in CODs and MODs. This was because in Cambodia, at that time, the negative consequences from dual practice by health workers were widely acknowledged and highly prevalent (MOH 2005; SRC 2006). The contract agreements for the DFID/World Bank contracting project included a requirement that the health workers' abstain from private practice (MOH 2001). The need to prohibit, or at least regulate, dual practice was therefore acknowledged at the beginning of the contracts in the three COD districts.

Prohibition rules with enhanced monitoring (De Tella and Savedoff 2001) were introduced by the NGO Contractors (Chapter 5, 5.3) and might have been effective in the reduction of dual practice. The probability of detection may have influenced a health worker's decision not to conduct dual practice (De Tella and Savedoff 2001). NGO Contractors in two CODs (HNI in Peareang and SRC in Kirivong Operational Districts) strengthened the existing MOH prohibition rules and all three contractors enhanced their monitoring of dual practice (Chapter 5). RHAC in Prea Sdach Operational District, did not introduce their own rule but

applied the MOH's, which were the most lenient prohibition rules among the three NGO Contractors: "*if it (the MOH rule) is followed strictly, it is sufficient*."(KI02, 22 Aug 2007).

Differences in the strengths of prohibition among the three NGO Contractors may reflect their perspectives of health workers' dual practice, income from private practice, and income from the government. Consequently, it could be inferred that health workers' incidence of or income from private practice might, to some extent, have been framed by the NGO Contractors' reflections on these factors and inclusion in their incentive design. Their incidents of or income from private practice did not appear to respond directly and exclusively to the differences in the level of the contractors' prohibition rules. However, it is noted that evidence from descriptive statistical analyses (Table 7-1-3) showed health workers in all CODs had reduced dual practice. The evidence for this was shown in their lower incomes from private practice than in MODs.

In Preah Sdach Operational District, which was under RHAC's management and where the prohibition rule was the most lenientt, the mean income from private practice was the lowest among the three CODs, with a participation rate among the health workers of less than 10%, the middle range among the three CODs. However, In Kirivong Operational District, while the prohibition rule was the middle strength, the mean income was the highest, with a participation rate above 40%. In Peareang Operational District, also, the level of prohibition did not correspond with the outcome (Table 7.2, Table 7-1-1). However, it is noted that other factors may also have affected the level of income.

RHAC also appeared to make more explicit efforts to ensure a certain level of government sector income to the health workers including the performance-based payments associated with contracting, acknowledging that government regular payments were below their living cost, as seen in some other LMICs (Ensor and Witter 2001). RHAC's approach seemed, in part, to affect health workers' labour supply. RHAC, at the beginning of implementation, engaged in negotiations with the health workers regarding a liveable wage:

"(s)ince government salaries were low. ...negotiations (with health workers were held) ...(about) what constitute(d) a liveable wage ...(and payment) that was agreeable (with them)s" (KI02, 22 August 2007).

In Preah Sdach Operational District, the health workers income from the government sector was the highest among the three CODs (Table 7-1-1).

Interestingly, the mini-survey, which investigated payment allocation methods at the subcontractor level, found that some subcontractors imposed a penalty on health workers' conducting dual practice, in addition to those already imposed by the NGO Contractors (Chapter 5. 5.3). This action again suggests the prevailence of dual practice at some early stage of the implementation and that health workers' were being regulated in order to reduce dual practice.

8.3 The importance of the perforamence based payment

8.3.1 Changes in labour supply in CODs after the contracting project

Based on a synthesis of the findings, this study argues that the health workers' higher income in CODs than MODs has been achieved by the payments associated with contracting settings, raising the income from government sources to almost equivalent level of private practice income earned in MODs. The main supporting quantitative evidence for the above arguments follows:

1) The payments associated with the contracting settings reached around 60% of the income from health work excluding private practice and 40% of their household income among health workers in CODs. This raised the income to a comparable level with the private practice income of health worker in MODs. These proportions were achieved despite that fact the health workers had different income sources (Table 6.2).

2) The results from the regression analyses indicated a reasonably high magnitude of the Operational District status as CODs with statistical significance on increase in incomes compared with MODs. The results also showed that the particular effect seemed to be more important than the effects of other factors concerning the districts and the health workers. The factors were also hypothesized to be potentially influential before the test, and included the economic status of districts and the levels of prohibition of dual practice in them and the health workers' cadres, taking demographic attributes into account (Tables in Chapter 7 after 7.5 and summary tables: Table 7-47-1. -2).

Further, based on the synthesis of the quantitative (Chapter 6, 7) and qualitative evidence (Chapter 5 and above), a reduction in dual practice by the COD health workers can be tentatively argued. The quantitative evidence showed that income from private practice was

much lower in CODs than in MODs, and sometimes none in some cadres in CODs, while in others the incidence was also much lower and, again, none in some cadres in some CODs (Table 7.2). Proportional declines in private practice income were also found. Income from private practice was noticeably more substantial in the two MOD districts, and contributed significantly to total household income (Tables 7-1-1, 7-1-2, 7-2).

The following evidence further strengthens this tentative argument. During the household survey of this study in July 2007, dual practice was observed less in CODs than in MODs by the surveyors[22], suggesting the possible reduction of dual practice in CODs. A decrease in dual practice was also established in a study by Jacobs et al. (2010) in Kirivong Operational District. In this Operational District, from 2005 to 2006, the percentage of deliveries at government health facilities increased from 39% to 59% of the total number of deliveries in the catchment area of the health facilities. Jacobs et.al (2010) argued that this showed that the midwives' private practice had decreased: they supported more than half of the deliveries at the government facilities.

In the qualitative study, health workers in CODs were found to complain about the economic difficulty caused by the prohibition of dual practice .In this example, the complainant focused on the complete prohibition of dual practice - including the pharmacy business of a family member - in Peareang Operational District, the COD with the strictest prohibition rule (Chapter 5, 5.3). "Health workers here are complaining. Not only their private practice, but also their family's business was prohibited… wives (of health workers) can not run pharmacy, can not earn income… (we have) economic difficulties." (KI09, June 20 2007).

Health workers' complaints about the stringent prohibition were also found in the mini-survey about subcontractors' payment allocation methods.

What these complaints may indicate is that health workers' were reluctantly reducing or stopping dual practice. However, despite some evidence of such reductions, the NGO Contractors appeared to perceive persistence in health workers' dual practice in Peareang and

[22] The surveyors claimed, at debriefing meetings during the fieldwork, and it was recorded in a report (Abe 2007): "(I)nterviewing in the OD not contracted out (MODs) was not easy because some of them (health workers) did not come to work when the survey team visited HCs (Health Centres) even when they were on duty. Private practice by GHWs (government health workers) was more active in the afternoon…".

Kirivong Operational Districts.

"We intensified monitoring on their private practice. …, but it was difficult to stop it." (KI05, June 19, 2007)

The prohibition rules seem to reflect the perspectives and judgements about dual practice being conducted in their Operational Districts of the NGO Contractors, whose own values or missions or work ethics represent a difference between the NGO and the government sectors (Lewis 2001). The NGO Contractors' perspective may be associated with the notion that NGOs are more effective at health service delivery than the government organisation (Gilson et al 1997; Strong et al. 2005; Eichler et al. 2009). They, as the principal, may be stricter on the agent's cheating than the public sector. However, NGO contractors were still surrounded by the complex public sector incentive environment (Balsey and Ghatak 2003), with the result that their prohibiting dual practice often seemed to be frustrated by the discretionary decisions (Mathauer and Carrin 2010) taken by the Provincial Health Department (PHD) found in the key informant interviews (Chapter 5):

"It is difficult to stop their private practice, because PHD does not punish the health workers, though we requested punishment," (KI04 March 17th 2006).

The labour supply transfer in the three CODs, which are tentatively argued, were found to differ by Operational District, by cadres, and cadres by Operational District, given that income from private practice in all CODs was much lower than MODs (Table 7-1-1) and as noted in relation to the level of prohibition rules above (8.2). The income from the government sector also differed by the same tabulation, but with a less degree.

8.3.2 Secondary nurses' benefit influenced by different policy implementation by NGO Contractors

An interesting finding from the mixed methods approach was that differences in the contracting policy implementation by the three NGO Contractors appeared to benefit the incomes of various cadre groups in CODs in different ways. However, as noted in Chapter 5, the principles of the implementation of each NGO contractor were similar, e.g., making the performance-based payments connected to quantitative indicators and primarily based on health workers' cadre and positions in the MOH health system (Chapter 5)

Secondary nurses in CODs, however, seemed to benefit less than primary nurses from the intervention, in terms of the coefficient for COD, the variable, in regressions of (Ln) income

from health work (excluding private practice) on the same set of independent variables (Model 1). The coefficient for COD was 0.710 for a secondary nurses in CODs but 0.773 for a primary nurses (Table 7.7, 7.6).

Effectiveness of financial incentives depends on the principal's capability of designing the incentive with regard to fluctuations of the incentive payments. The agent wants to avert fluctuations of the incentive payment but accept to be paid the incentive payments. Therefore, the agent's cost in accepting fluctuations needs to be responded to by the principal in the incentive design. (Milgrom and Roberts 1992; Milgrom and Holmstrom 1991; Eichler et al. 2009). NGO Contractors appeared to have variously incorporated the significance of costs into their incentive design, where the health workers needed to reduce income from private practice. It seemed that the NGO Contractors reflected, in the incentive design, their own perspective about the contracting-related payments, income from private practice and the balance between the contracted-related payments and private practice income.

The three NGO Contractors' bottom line appeared to be common. That was to pay "livable wages" (KI01, 23 April 2005) to all health workers in their Operational Districts. This seemed that they intended to reflect their idea about ensuring the level of total payments, regularly paid, at a level which enabled the health workers to live decently (Chapter 5)

Qualitative evidence of this study (Chapter 5) showed that the lower benefit for secondary nurses might have been attributable to the NGO Contractors' different incentive designs and implementation practices, including their prohibition of dual practice, in relation to the cost to the secondary nurses.

The lower benefit of secondary nurses than of primary nurses might be explained by inferences about the mean income from the government sector including the contracting-related payments in secondary nurses in Kirivong Operational District. This was because the number of secondary nurses in Kirivong was nearly half the total number of secondary nurses, which were the largest group of this cardre in CODs (46.8%), and 34.4% of all secondary nurses, which may have contributed to the lower benefit. The Kirivong secondary nurses obtained the lowest mean among the three CODs: nearly 81% of Prea Sdach's and 92% of Peareang's mean (Table 7-1-3). The Kirivong cases were distributed mostly in lower income ranges among all COD secondary nurse cases (Table 7-1-3).

In contrast with the secondary nurses' lower benefit, the payment guideline set by the NGO Contractors, including SRC in Kirivong Operational District, were highly likely to accommodate higher payments to secondary level health workers than the primary level (Chapter 5, 5.2.(3)), reflecting their perspectives about incentives within the incentive design (Milgrom and Roberts 1992).

The income differentiation by qualification level was distinct from the MOH payment schedule in which the two levels of health workers receive basically the same government regular payments (Chapter 6, Table 6.8). In the project implementation, actual payments to health workers were made by the subcontractor at the subcontractor facility. However, it is likely that the higher payment allocations to secondary nurses have been maintained at the subcontractor level payment allocations, since the evidence from the mini-survey of this study showed that cadre was a key criteria in allocating payments (Chapter 5, 5.2.(6)).

Then, why was the mean income of Kirivong secondary nurses low? This might have been due to the incentive design by SRC. Differently from the other NGO Contractors, SRC formulated a payment schedule to individual health workers which was coordinated with the total payment to the subcontractors and SRC's criteria for payment allocation for health workers (Chapter 5, 5.2.(3)). The low income may, in part, have been the outcome of the payment schedule and also, in part, have been associated with SRC's concern about possible reductions of the income after the end of the contracting project. SRC restrained the payment to individual health workers in order to narrow income gaps between the payments to health workers during and after implementation of the contracting project, based on an assumption about problematic reductions in the payments after the end of project (SRC 2006). It would be difficult to hypothesise that the low income might have been largely attributable to low performance of the secondary nurses, given that the achievements of the performance objectives of implementation were evaluated highly (SRC 2006), and an investigation about the relationship between the incentive payments and health workers' performance was out of the scope of this study.

However, having an effective incentive design is often disturbed by the information asymmetry (Milgrom and Roberts 1992) in their designing process (Chapter 5). Interviews with RHAC's manager indicated that the NGO seemed to carefully reflect, within the incentive design, the health workers' preferences about their incentives (Milgrom and Roberts 1992). This seemed, in part, to be due to RHAC's reduction of the information

asymmetry through significant negotiations with health workers about their preference, as noted in the previous section. In Preah Sdach, the secondary nurses' mean was the highest among those in three CODs (Table 7-1-2).

RHAC might have advantages in capturing the health workers' preference about their payments. RHAC was one of the most established Cambodian NGOs in the health sector, having long-working experiences of large scale projects in cooperation with major bilateral donors. Therefore, they might have been particularly able to capture the health workers' preferences. Their managers also included ex-managers of the MOH health system (Personal Observations) who had experience of the incentive environment in the government sector, which might have been a further advantage.

The income from the government sector and from private practice were intricately correlated (Shishko and Rostker 1976). The lowest income from the government sector was received by the Kirivong secondary nurses (Table 7-1-3) among the three COD's secondary nurses. We can infer from this level of income that the secondary nurses may still have been inclined to conduct dual practice (Shishko and Rostker 1976; Chernichovsky and Bayulken 1995), due to their interest in ensuring that the total income from health work was close to their preferred level.

This inference was consistent with evidence of this study's quantitative investigation. The Kirivong secondary nurses obtained the highest mean income from private practice among the secondary nurses in all three CODs (Table 7-1-3). In addition, the number of health workers in Kirivong Operational District who reported conducting dual practice was the highest rate among the three CODs (Table 7.2).

However, it is important to bear in mind that it is possible that other factors in the incentive environment might have influenced the Kirivong secondary nurses' income. For example, the weak enforcement measures for the prohibition by PHD discussed above might have invited their conducting dual practice.

8.3.3 Midwives' benefits brought by the payments associated with the contracting

In contrast with the situation of secondary nurses, both primary and secondary midwives in the CODs, compared with midwives in MODs seemed to obtain a significant benefit from the payments associated with the contracting setting and other components of the

intervention. This can be seen in the high coefficients for the following variables: all CODs together, then each separately (Peareang, Prea Sdach and Kirivong), and in the regressions of the income from health work excluding private practice in midwife cases. The difference between COD and MOD in terms of the income of midwives was sufficiently high, assuming all other conditions were equal. The difference in income of midwives between each of the three CODs and Kamchay Mea, a MOD, was also sufficiently high (Table 7.8, 7.12, 7.16). These higher incomes were supported by results from the descriptive statistical analyses. In CODs, the mean of income from the health work (excluding private practice) was more than 65% of the mean total household income. However, in MODs the mean income was only slightly higher than 50% (Chapter 6, Table 6.4)

Another distinctive point concerning midwives' benefit between CODs and MODs was a narrower income gap in government sector income between midwives and nurses in CODs than in MODs. Midwives' incomes in the MODs were distinctively lower than that of nurses', even though nurses still obtained higher income than midwives in CODs (Chapter 6, Table 6.4). In MODs, the secondary midwives' mean income was lower even than primary nurses. Interestingly, the income gap in MODs (Table 6.4) appeared to disagree with the MOH payment scale (Chapter 3, Table 3.2) in which nearly all of the midwives and nurses surveyed seemed to belong to the same grade. Therefore, theoretically, income gap which occurred between midwives and nurses in MODs should be limited.

Evidence from the Key informant interviews and the mini-survey support the narrower income gap. The sub-contractors and NGO Contractors appeared to put emphasis on a) health workers' performance and b) differences in cadre including qualification level, as found by this study (Chapter 5). A subcontractors' payment allocation method appeared to capture and encourage midwives' high performance in order to achieve the subcontracting objectives. The specific method applied by a subcontractor appeared to increase midwives' income, as they utilized an indicator independently from the NGO Contractor. The indicator evaluated the midwife's performance more sensitively and thoroughly. It was concerned with whether more than 10 deliveries were supported at the health center. If more than 10 deliveries were supported, the midwives at the health center received a bonus for it at the subcontractor-level payment allocation. This arrangement seemed to be an additional financial incentive to the midwives. This arrangement could be associated with institutional and organisational discretion (Mathauer and Carrin 2010). This type of special arrangement might have been implemented by other subcontractors; however, such a generalization would

require more supporting evidence.

The secondary midwives' high benefit (Table 6.4) may be explained straightforwardly by the NGO Contractors' payment guidelines (Chapter 5). The guidelines differentiated payment by qualification level: primary or secondary (Chapter 5, Chapter 3, Table 3.2). This is confirmed by the evidence that in MODs, secondary midwives obtained a mean income with a limited difference from that of primary midwives (Table 6.4). However, as noted in Chapter 5, the payment allocation in the CODs was ultimately delivered by subcontractors at Health Centre level, making it difficult to identify the extent to which the payment guidelines of NGO contractors contributed to the narrower gap in CODs.

While acknowledging these differences concerning the midwives' income from health work in government sector between the CODs and MODs, it is difficult to explain the mechanism for the difference, particularly in relation to differences in implementation of the contracting by the three NGO Contractors.

It was apparent, from the complete enumeration approach used in this study, that there was a shortage of midwives, particularly secondary midwives in both the CODs and MODs and the five individual Operational Districts surveyed (Table 7-1-1, 7-1-2). The shortage issue was supported by the evidence from the key informant interviews; for example, the interview about staffing in Preah Sdach Operational District highlighted the shortage issues in that district, "*we have almost no midwives in our staff….Most of our staff is at the primary level*" (KI02 July 24, 2006).

The narrower midwife-nurse income gap in CODs might have been able to mitigate the secondary midwife shortage issues, if the outcome was able to be maintained without being affected by other factors. However, as noted in Chapter 2, retention of health workers is influenced not only by financial incentives but also by non-financial incentives (Willis-Shattuk et al. 2008).

Compared with primary midwives, the income of secondary midwives and nurses might have been judged as disproportionally low, as noted in Chapter 3. This perception was heard frequently in the context of the pre-service education of midwives and was attributed to the shortage of secondary midwives (Personal Observation). The perception seemed to be generated by the fact that, in spite of longer term pre-service education for secondary

midwives than for primary midwives and even secondary nurses (Fujita 2009), the secondary midwives' government salaries were very similar to primary midwives' and nurses' (Table 3.2). The issue of lower income was recognised by the MOH as a contributing factor to the shortage of secondary midwives (Sherratt 2006) and was reflected in their policy during this study's fieldwork. The increases in their incomes in CODs might have contributed to mitigating the serious shortage of midwives, particularly secondary midwives, in Cambodia's rural areas (Chapter 3.3, Sherratt 2006). However, this argument still need further evidence.

8.3.4 Emphasis on non-merit based payment allocation methods at the Subcontractor level

The narrower difference between midwives and nurses in CODs discussed above was consistent with one of the common approaches to payment allocation which the mini-survey found at the subcontractor level. The approach appeared to ensure a certain explicit level of 'equality' that was desired among the health workers (Chapter 5, 5.2.(6)). This is despite the observation that this approach seemed to be contradictory to the aim of the performance-based payments in the intervention (DFID/World Bank Contracting Project) area. Their approach appeared to show their preference for less or non-merit base payment to the performance-based payments which they felt would damage the teamwork among them (Chapter 5, 5.2.(6)), particularly with a limited number of health workers. A key informant commented:

"*Primary nurses, secondary nurses and primary midwives can be treated as one group, actual implementers of the contracting project one group. They… are working together at most of Health Centres, so that they understand their work, their feelings, and what they are doing other than their work at Heath Centres, including their private practice*" (KI18, August 20, 2006).

Taking the approach, which differed from the intention of the project, could be understood as institutional and organisational discretion (Matheaue and Carrin 2010). The finding of this approach, as well as some subcontractors' taking different or even deviated payment allocation methods, was meaningful, offering yet another insight into the black box of the incentive environment (Chapter 8, 8.5). In the box, i.e., at the subcontractor level, the intended outcomes of the performance-based payment might have been altered or disturbed.

However, the finding of this approach appeared to be significant within the context of this

study, because it suggested that the health workers' might not accept merit-based incentives. Based on this, one can infer that, rather than performance-based payments, other types of financial incentives may be more acceptable. Whether or not alternatives would need to achieve a similar level of income increases is difficult to decide and is outside the scope of this study.

8.4 Methodological contribution to the literature

The key informant interviews contributed to a fuller understanding of the payment mechanisms associated with the contracting settings and the incentive environment. The NGO Contractor Managers elaborated the payment mechanism, institutional and organisational arrangements, including the discretionary decisions and related implementation rules by the NGO Contractors and the background information of the project implementation. Most of these findings were unstudied and/or largely undocumented. It was found that, while the NGO Contractors in the studied districts share common implementation policies and approaches in principle, there were differences in implementation. In particular, the discretionary institutional and organisational arrangements were found to be exercised implicitly but affected the implementation significantly. NGO Contractor managers' perceptions about incentive designs and the prohibition rules of dual practice enabled an in-depth understanding of outcomes of the incentive payments.

The household survey collected 250 cases from three CODs and two MODs and obtained health workers' and their household incomes and expenditures with a high degree of accuracy by asking questions which reflected characteristics of their incomes from different sources and rural Cambodian life and livelihood in general. Therefore, comparisons of the incomes and expenditures between CODs and MODs and among other groups of cases gave convincing results. The comparisons presented strong evidence for the high impact of the payments associated with the contracting settings with statistical significance. The evidence from household survey also provided concrete and detailed variables and hypothesis for the regressions analyses. The complete enumeration approach of the survey successfully collected sufficient number of cases for the regression analyses.

The regression analyses presented strong evidence that the payments associated with the contracting settings made the largest contribution to differences in income and expenditure, with statistical significance among the factors, i.e. the independent variables. The theoretically selected independent variables made it possible to demonstrate that the payments were much more influential than the economic status of Operational Districts and

the levels of prohibition of dual practice which were also hypothesised to influence the incomes and expenditures. The regressions conducted on cases grouped roughly into two: with both all health workers and health workers by cadre it was possible to confirm the large influence of payments.

The mini-survey provided notable evidence which contributed to an in-depth understanding concerning the impact of payments associated with the contracting settings. The evidence enhanced the findings about the institutional arrangements for the payments and extended explanations about the income differences between CODs and MODs, as well as among cadres in each and between the two types of Operational Districts. The survey presented evidence that subcontractors applied discretionary payment methods which emphasised the concern to maintain an equal distribution of payments among health workers at the facility in their allocation, differently from the NGO Contractors' payment approaches and in contrast to the purpose of performance-based payments (Chapter 5, 5.2. (6)). Thus the subcontractor payment methods might have influenced the actual payments, i.e., the outcome of the payments associated with the contracting settings, while other factors also might have influenced outcomes.

As noted in several points above, mixed methods research contributed significantly to this study. The following describes the particularly important contributions, which were in accordance with Bryman's rationale for the mixed method research (Chapter 4) (Bryman 2012). First, the approach of this study presented new and important evidence which facilitated a more comprehensive understanding of the impact of performance based payments. The quantitative investigation: household survey and regression analyses provided strong evidence for the significant impact of the payments which resulted in higher incomes in health workers' and their households in CODs than in MODs. The qualitative evidence compensated for the constraints of quantitative investigation, the non-experimental settings, i.e., absence of the baseline data. It also accommodated valuable insights into the impact of payments, payment mechanisms, and the complex incentive environment. The mixed methods research accommodated the triangulation of findings from both methods of investigation and raised the credibility of the findings within the context of a general shortage of literature.

As noted in the section above, findings from the key informant interviews contributed to consecutive quantitative investigations: selecting variables and formulating questions in the

household survey; selecting variables for regression analyses. The insights obtained from the key informant interviews enabled a more comprehensive understanding of the evidence derived from the household survey and the regression analyses. It also extended and deepened the explanations about how and why the quantitative outcomes of payments were brought in. The mini-survey presented evidence which enhanced the understanding of payment mechanism by the key informant interview and contributed to the explanations of the quantitative outcomes of payments. Consequently, findings from the two methods were synthesized.

The outcomes were the income differences, the labour supply changes, and the differences in benefits among the cadres. The qualitative evidence presented plausible explanations, not only about the contracting- payments' strongest influence to but also significant influence by the payment mechanism at NGO and subcontractor levels and by the incentive designs formulated by the NGO Contractor. The assessment drew on the institutional processes and rules that were revealed through the key informant interviews. These plausible explanations were supported neither simply by figures nor abstract narratives, but by concrete quantitative evidence of the income differences. They were supported also by comprehensive and qualitative evidence of actual implementations and institutional settings. These findings are, therefore, particularly useful.

8.5 Theory of change

The theory of change (Chapter 2 Figure 2.1) developed for this study was effective and guided most of the factors, as well as changes brought by the factors and flows of consecutive changes toward the policy objectives of DFID/World Bank Project. However, retrospectively, the theory of change can be categorized as one that is framed by the top-down approach to policy implementation (Walker and Gilson 2004). It understands that policy implementation consists of rational plans, processes and control at the center level. Effective implementation is considered to be possible, upon the requirements of implementation being fulfilled. Failure of implementation is considered to be attributable to inadequate planning (Walker and Gilson 2004). The top-down approach seemed to be inconsistent with the evidence presented by this study. The evidence showed that factors, processes or changes, which may be seen as unexpected or irrational from the perspective of the top-down approach and this study's theory of change, actually influenced the implementation and outcome of the contracting-related payments.

Another approach to policy implementation, the bottom-up approach (Hjern & Porter 1981),

perceives that an understanding of systems and actors is necessary for the implementation and is important to the understanding of reasons for the failure of implementation. This approach might have been more suitable for framing the theory of change of this study, since an understanding of payment mechanisms and NGO contractors and subcontractors as implementers accommodated important insights into the impact of the incentive payments.

Also, this approach regards discretionary practices by actors (Hjern & Porter 1981), such as those Lipsky calls Street-level Bureaucrats, significant to the policy outcome (Lipsky 1980; Walker and Gilson 2004). The factors, processes or changes in this study were influenced largely by the organisational and institutional discretion (Matheau and Carrins 2010) which seemed to include 'Street-level Bureaucrats' (Lipsky 1980). Noticeable discretions were applied to payment allocations at the subcontractor level and the implementation of enforcement measures of PHDs, and the different payment guidelines and payment schedules by NGO contractors.

Importantly, this study illuminated a comprehensive depth of understanding of health workers' preferences as a key factor in effective incentive design (Milgrom and Roberts 1992). Discussion about the incomes of Kirivong secondary nurses was indicative of the significance of this factor. Their preference for the form of incentives was also found to be a significant factor in implementing the incentive payments. The outcome of their preference for non-merit based payment were discussed above. Therefore, health workers' preference should be included in order to improve the current theory of change.

8.6 Conclusion

The payments associated with the contracting settings of the DFID/World Bank Contracting Project brought in sufficiently higher income to the health workers and their households in CODs than in MODs, raising their income received from the government sector. It was tentatively argued that health workers spent labour supply more in the government and less in the private sector in CODs compared with MODs, thus transferring their labour supply, i.e., decreases in dual practice in CODs. These tentative arguments were underpinned by the proportional changes in private practice income in relation to the total household income between CODs and MODs.

From the qualitative evidence, it was found that, at the beginning of the implementation of DFID/World Bank Contracting Project, the health workers in CODs actively conducted dual practice. This evidence compensated, to some extent, for the lack of baseline sources of

income. Consequently, this evidence strengthened the above tentative argument for a reduction of private practice. It is noted that the reduction appeared to respond much more to the payments associated to the contracting than the differences in the strength of the prohibition rules.

Mixed methods research provided interesting findings. Different levels of benefit from the contracting payment scheme among cadres seemed to be attributable to differences in the implementation by NGO Contractors. The differences, then, seemed to reflect their perceptions/perspectives about the importance of payments to the health workers and about health workers' preference for the payments. The Kirivong secondary nurses, who seemed to benefit less, may fall within the spectrum of this explanation. It is noted however, that the payments to the health workers were highly likely to be exposed to sub-contractors discretions.

The narrower income gap in the government sector income was found between midwives and nurses in CODs than in MODs. This might be attributed to institutional arrangements by the NGO Contractors and by subcontractors who exercised discretion. Subcontractors' payment allocation methods were found to be more 'egalitarian', in that there was an emphasis on maintaining equal payments among health workers, in contrast to concept of the performance-based payments. This approach might have narrowed the income gap. Finally, but importantly, there were other factors in the incentive environment which might have influenced the health workers' income.

Chapter 9 Conclusion

This chapter first presents both empirical and theoretical contributions to this study, followed by its limitations due to inherent causes and the study design. Next, policy recommendations based on the findings are presented. Finally, a proposal for possible future study based upon the current study is presented.

9.1 Contribution of this study

This study has explored the impact of performance-based payments on the government health workers' incomes and their household incomes in contracting out government health services in rural Cambodia. Through findings from the exploration, this study contributes substantially to our comprehensive understanding of the impact of these payments, by articulating concretely the significance of the impact on the government health workers' incomes and their household incomes and an understanding of the implementations of the payments by NGO contractors.

A remarkable finding of this study was that the payments resulting from the DFID/World Bank Contracting Project had a significant impact on realising higher income in health workers' in CODs than in MODs. Their higher incomes were achieved largely through these payments. The government sector income almost reached an equivalent level with that of private practice income earned in MODs. This study presented these findings with concrete quantitative evidence, as powerful evidence for the argument that the payments make a meaningful contribution.

Theoretically also, this study contributed significantly, by revealing and elaborating the complex incentive environment and deepening the understanding of it. This environment was influenced by various factors such as the public sector characteristics, health workers' dual practice, dual practice regulations, health workers' having multiple income sources, and institutional and organisational discretions. Concerning these factors, theoretically significant findings were obtained about the influence of NGO contractors' payment mechanisms including incentive design and other implementations. These factors had a large influence on the environment as well as the outcomes of financial incentives, sometimes unexpectedly. Different implementation practices among the contractors accommodated different levels of benefits to health workers by cadre; their incentive designs reflect their different views of the importance of the incentive payments and income from private practice.

However, the identified subcontractors' discretionary payment allocation methods, i.e., the institutional and organisational discretions, also largely influence the actual payments to the health workers. They would sometimes override what NGO contractors intended and what the performance-based payments meant to achieve; the health workers' preference for an equality of payments among them diluted the merit-based rationale for the payments. It is noted that the significance of the discretions concerning the incentive payment has received little attention in the literature about financial incentives to health workers in LMICs.

9.2 Limitations of this study

This section discusses limitations of this study, which are categorised as those which are inherent in the research environment or those which arose from the design of this study.

A lack of relevant literature posed (Chapter 5) a huge barrier to obtaining sufficient background information as well as specific information relating to the DFID/World Bank contracting project and the selection of a study site. This required the investigator to collect background information and primary data and consume larger resources than planned. This problem also affected the formulation of key informant interview questions which could produce efficiently relevant replies. Consequently, the investigator needed to have multiple interviews with the same key informant.

The lack of statistical data about economic development in each of the five Operational Districts was an issue, since the level of economic development was one of the selection criteria for matching them as study sites. Consequently, selection of the five Operational Districts used comprehensive socio-economic criteria which drew on the criteria widely used in studies and practice in rural development (Chambers 1997). After the selection, the commune-level poverty rates found in a poverty map (MOP and WFP, 2003) were applied to further investigate the levels.

All of the key informants were those who spoke English and the interviews were conducted in English. Having only English speakers might have reduced ranges of experiences and perceptions heard in the interview. Inclusion of non-English speaker-informants would have solved this issue. However, hiring a fluent interpreter between English and Khmer who has sufficient working experiences in the health sector proved excessively expensive to this as a PhD study.

This study applied SPSS, which was available in Queen Margaret University. The SPSS

default setting did not have some types of statistical tests such as Chow Test and the White Test which were not originally intended to be included in this study. These tests are available in the default setting of Stata and SAS. Conducting these tests by SPSS required the investigator to undertake additional work: extensively investigating the data and the test algorithms often on the internet or through personal consultations; finding and adjusting syntaxes to be used on SPSS. This extra work consumed a significant amount of time. Instead of SPSS, in future quantitative studies the investigator will use Stata, which accommodates more varieties of statistical tests in the default setting than SPSS.

The design of this study - quasi-experimental cross sectional study with mixed methods - was affected by the lack of baseline data of different types of incomes, particularly the income from private practice. This was due to the timing of this study which was after the beginning of the DFID/World Bank Contracting Project. It was impossible to compare the incomes in CODs and MODs between ex-ante and ex-post of the project.

Consequently, concretely identifying the degree of the impact of payments on changes in health workers' labour supply between the government and private sector, before and after the implementation of the contracting project, was difficult. A reduction of dual practice could not be conclusively argued. The lack of available publicised and written information relating to the incomes in CODs and MODs was also unhelpful in reducing the weakness of the design. However, a merit of the mixed method study, the synthesization of results from quantitative and qualitative research in this study, compensated for these limitations by providing evidence for the prevalence of dual practice at the beginning of project implementation.

A response to the limitation of a lack of baseline data could be the conducting of another qualitative investigation after the regression analyses, in support of the advantages of the mixed method approach and the sequential implementation (Bryman 2012; Creswell 2011a). This investigation would be expected to compensate for the lack of ex-ante data of income from private practice and deepen understanding of the impact of payments on changes in the labour supply as well as factors influencing the incentive environment.

This investigation would employ key informant interviews which would be expected to confirm, through the informant's perceptions, the evidence for changes in labour supply presented in the current study. The interviews would also explore income differences brought

about by the implementation and the institutional and the organisational rules and discretionary practices of NGO Contractors and sub-contractors. These institutional and organisational elements were found by the current study to have had a significant influence on incentive payments, such as the payment allocation methods, at the subcontractor level. The income differences were found to be associated with health workers' responses to the incentives, i.e., labour supply change, such as the case seen among Kirivong secondary nurses. Informants should be mainly staff-level health workers in CODs but include the same NGO Contractor managers and managerial-level health workers in CODs who were key informants in the current study, since they have a good knowledge of institutional arrangements. The staff health workers are not likely to speak English. If so, the current study's bias for the key informant selection based on their speaking English will be reduced.

The current study's complete enumeration approach collected a sufficient number of cases for the various regression models. It had the advantage of collecting data in developing countries where data for formulating a sampling framework are problematic and physical and resource constraints disturb data collection following the framework (Milligan and Njie 2004). However, the cases collected by this approach had a bias in their number or became too small in number when they were divided by their attributes. Therefore, some regression models and matching of cases by health workers' attributes were impossible (Chapter 6).

This data bias and small number, may have been avoided by selecting other Operational Districts with a higher number of eligible health workers instead of the current CODs and MODs; however, it was impossible for the current study. The selection of CODs in this study, which largely influenced the selection of MODs, was greatly constrained by geographical, physical and other conditions.

Before selecting the individual CODs, the two provinces (Prey Veng and Takeo Provinces) were selected as the provinces from which CODs, and subsequently MODs were selected from Prey Veng Province. The two provinces had advantages over the other five provinces where Operational Districts were contacted out. Most of these five provinces were scattered in the remote peripheral or border areas. The areas were suffering physical access problems from the capital, national border conflicts, other security problems, under-developed basic physical infrastructure, and problems concerning ethnic minorities (World Bank 2006, 2007; MOH2007b). Coping with these problems seemed to be beyond the resources of a PhD

study. These problems seemed also to present too great a challenge in recruiting surveyors for the household survey.

Even Prey Veng and Takeo Provinces shared some of these problems, but to a lesser degree. Also, these two provinces were located side by side in the areas within about 250 Km of the capital, which accommodated the selection of three CODs with similar characteristics.

Adding another Operational District as a MOD from either Prey Veng or Takeo Province may be thought to have been appropriate, since it would have been expected to reduce the problems in the collected data. However, it is important to bear in mind this addition would be possible only if the following conditions were fulfilled. This is because the current non-selected Operational Districts in these two provinces were once screened by the investigator with the criteria on the possibility of their becoming MODs, the controls (Chapter 4 and Appendix 5). This fact requires these Operational Districts to be much scrutinised, importantly in relation to on-going health projects there which are being supported by outside organisations such as NGOs. If there are on-going health projects, their financial and non-financial incentives to health workers and routine managerial support are to be quantified, clarified, and checked (Chapter 4 and Appendix 5), in order to concretely include their influence in the analyses. Distinguishing this influence is necessary to increase the suitability of the Operational Districts as a control, in the qusai-experimental cross-sectional study with mixed methods.

Upon adding a new MOD, excluding some cadres from the data collection in all CODs and MODs is expected to reduce data bias in collected cases. The cadres to be excluded are those whose original membership was estimated as quite small within a rural health centre (Chapter 3). They are doctors and assistant doctors.

In the mini-survey, the small number of surveyed subcontractors reduced the ability to generalie about the findings. The size of the survey was due to the late inclusion of a mini-survey in this study; only very limited remaining resources were available to the survey.

The household survey asked a large number of detailed questions covering varieties of expenditures. They were able to collect accurate expenditures; however, retrospectively not all questions were necessary, considering the time span of the DFID/World Bank Project and

generally known tendency of Cambodian health workers' way of living and non-health economic activities. Reducing the number of unnecessary questions would have been expected to increase resources availability for improving research design as stated here.

9.3 Policy recommendations

Applying effective financial incentives to health workers in LMICs, particularly in the post-conflict and/or fragile state, is crucial for changing health workers' behaviour and consequently increasing service delivery. The findings presented by this study demonstrated that performance-based payments are effective for this purpose. The evidence has significant implications for policies adopting such payments under the resource constraints including institutional capacity commonly seen in LMICs. The evidence presents responses to previous policy failures to pay effective incentives.

The evidence showed that incentive payments have an effective impact if the payments increase the health workers' total income from the government sector sufficiently, being at a comparable. Thus, such incentives contribute to restraining dual practice in the countries where enhancement of regulatory institutional settings is difficult (Di Tella and Savedoff. 2001; Ensor and Thompson 2006). Ascertaining the optimum level of payments helps to avoid either an excessive number of incentives or a shortage of incentives and reduces the loss of government resources for implementation of incentives. The level of incentives should reflect concrete robust data on health workers' and their households' incomes in the government and private sectors.

However, careful decisions regarding the institutional and organisational arrangements for the incentive payments are necessary in order to ensure its effectiveness, reflecting in the decisions the characteristics of the incentive environment, which are framed by public sector characteristics (Belsey and Ghatak 2003; Soch and Beek 2011) and institutional and organisational discretions (Mathauer and Carrin 2010). The impact of payments is affected by influential institutional and organisational discretions exercised, explicitly and implicitly, at different levels of the health system. Also, to ensure the impact, preferences of health workers about the form and payment mechanism methods of incentives need to be incorporated in the incentives design.

9.4 Areas for further research

In order to achieve a deeper understanding of the impact of financial incentives on health workers, changes in labour supply through financial incentives needs to be further

investigated by an empirical study with mixed methods in the form of the before-and after study. The current study argued that changes in health workers' labour supply in the government and private sector was brought about by the contracting payments settings. It tentatively concluded, based on the qualitative evidence, that transfer of their labour supply between the two sectors, i.e., a reduction of dual practice, was also brought about by the payments. Therefore, quantitative evidence for the labour supply transfer needed to be ascertained in order to better understand the impact of financial incentive on the labour supply transfer. Qualitative methods are essential for gaining experiences and perceptions of policy implementers and health workers about incentives and the incentive environment, given that the labour supply transfer may be influenced by other factors, notably institutional and organisational factors or non-financial incentives.

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Appendix
Appendix 1 Additional data of ADB Evaluation

Table A1.1: Mean change in health service coverage indicators by ADB Evaluation

	'Contract-Out' (%)	'Contract-In' (%)	'Control' (%)
Antenatal care	401.5	233.3	160.1
Delivery with trained personnel	0.0	0.0	26.0
Facility delivery	142.0	225.1	0.0
Antenatal tetanus immunization	400.0	148.6	149.1
Family planning knowledge (all)	599.5	317.4	307.4
Family planning knowledge (lower 50% Socio-economic group)	559.5	301.4	271.0
Contraceptive prevalence rate	122.6	104.5	93.4
Child immunization	158.1	81.8	55.7
Vitamin A capsule receipt (all)	20.9	18.1	-25.1
Vitamin A capsule receipt (lower 50% Socio-economic group)	23.9	29.9	-24.1
Illnesses treated in district health facility (lower 50% Socio-economic group)	1096.0	490.5	81.7
Average	320.4	177.3	99.6

'

'Contract-Out', 'Contract-In' and 'Control': definitions were the project's definitions and described in Chapter 2 in this theses.
Source: ADB 2002a. P.36 Table A6.1.Modified.

Table A2.2: Quality of care at Health Centres and Referral Hospitals (means among health facilities)

	Health Centres*			Referral Hospitals		
	Total point**		% achieved	Total point**		% achieved
	Baseline	Evaluation		Baseline	Evaluation	
COs		(436)	(73)	(50)	(380)	(80)
Ang Rokar	6	427	71	75	399	84
Memut	0	445	76	25	362	76
CIs		(454)	(61)	(98)	(411)	(86)
Cheung Prey	0	428	63	160	362	76
Krivong	0	518	63	60	434	91
Pereng	6	417	58	75	438	92
Control		(332)	(52)	(80)	(261)	(55)
Bati	0	346	51	60	160	34
Kamchay	17	362	56	50	316	66
Kroch Chhmar	0	302	50	160	276	58
Preah Sdach	0	317	52	50	293	61

COs = 'Contract-Out', 'CIs = 'Contract-In', Control = 'Control': definitions were the project's definitions and described in Chapter 2 in this theses.
Health Centre* = the cited source of data was the National Institute of Public Health (2001), no further details available. Total point** = the maximum possible points vary among the Operational Districts; they depended upon the number of Health Centres located in the operational district. OD*** = Operational Districts.
Source: ADB 2004. P. 30 Table A3.1modified.

Appendix 2: Interview guidelines to the key informants (examples)

March 2007

Interview guideline

Questions about rural livelihood and rural life for formulation of the questionnaire sheet (household survey) Example 1

(Sections for food and household enterprises)

1. Rural household

What are commonly seen household structure (household head, members constitute, comparison with the previous studies)?

2. Food expenditure

- What are sources of information for deciding food items to be asked?
- What are your comments about Comments of each food items/number of items asked by CSES 2003 (relevance to the study site, locality seasons, etc.)?
- What are your comments about structure of questions suitable Cambodian rural households?
- What is importance in home production and consumption to the household?

- What are important in purchasing methods (frequency, amount) by rural households, their recording the expenditure?

- What are your comments about possibility of checking of accuracy of reported prices using prices of goods at local markets?

- What are your comments about possible household members who could tell accurate food expenditure?

3. Household enterprises

What are common kinds of household enterprises in the area where the study site was included?

What are your comments about level of income and expenditure by household enterprise?

What are household enterprises as dual job by health workers (other than private practice types commonly seen) ?

Types Scale way of covering the loss from the enterprise

Who frequently conducts?

Profitability and sustainability as additional income source to health workers.

Interview guideline

Questions about rural livelihood and rural life for formulation of the questionnaire sheet (household survey) Example 2

(Sections for education, household enterprises – sub-section for primary industry)

1. Education

- What is common expenditure for education at different level written and unwritten in publications?

(school fees, fees for educational materials, extra charges for preparatory study and materials for examination provided and prepared by formal school teachers)

- What is means for transportation and fee?
- What is other expenditure (uniforms and meals)?

- What are trends for educations: double schooling, charges?
- What are your comments about education received by children away from the household (education in Phnom Penh or big towns)?
- What is the importance of education received by children away from the household (education in Phnom Penh or big towns)?

2. Sub-section for primary industry

- What are common types of activities in the primary industry operated by households in the area where the study site was included?

- What are your comments about applicability about written information about the activities in the primary industry?

(purpose of activities: commercial or home consumption, types of activities and products, seasonality,

main input and output, input to be purchased, common prices, frequency of purchases,

uses of agricultural machinery, labour sharing, profitability, etc.)

- What are your observations about health workers' household enterprises in the primary industry?

Interview guideline

Questions about implementation of contracting project by NGO Contractors No. 1 (NGO managers)

1. Reason for entering the contract relations with MOH

(1) What are reasons for entering the contract relations with MOH, objectives of NGO contractors in the contracting?

(2) Formation/organisational arrangement of the implementation

What are formation/organisational arrangement of the implementation?

(staff of NGO in the district, national or international, skill types of staff, etc.)

2. Districts responsible for

Please describe:

1) Area and locations

(distance and hours from Phnom Penh, main means and issues for transportation)

2) Socio-economic features

(the economic level, markets, road conditions and other basic infrastructure, main economic activities, educational level, ethnic compositions, etc.)

3) Health services

1 General conditions (diseases, health awareness, staff deployment, health facilities)

3. Staff situation (government health workers working for the contracting implementation).

- What is their status?
- How much do they receive from government salary?
- What are dual practice (frequency, income earned), working hours, motivation, changes in performance in the course of implementation)?

4. Dual practice

1) What are common dual practices?

What are the types ? What is importance of their dual practice?

2) What are rules of prohibition applied by the NGO?
3) What are your comments about compliance?
4) What are enforcement measures?
5) What are comments of Cambodian health staff about the prohibition you have heard?
6) What are Issues?

5. Types of payments to health workers
1) What are their basic salaries?
2) What are performance-based-payments?, What are your comments about the performance-based-payments?
3) What are methods of allocations of user-fees?
4) What are other payments do heath workers have?

6. Relation between the project implementation and the Provincial Health Department
What are your comments about?

7. Institutional issues for the contracting project concerning MOH and supporting donors
What are your comments about?

8. Possible MOH Depts.or organisations which may provide useful information for this study
What are your comments about?

9. Other information:
Differences from implementation of contracting out by other NGO Contractors (main emphases or characteristics of the NGO Contractors and other NGO Contrators) What are your comments about?

10 Other information (about the district not contracted out)
What are your comments about possible districts which seem to be suitable for this study (having quasi-experimental design)?

(similarities in socio-economic aspects, physical accessibility, accessibility to health workers in the districts through the Provincial Health Department and the (health) District Office)

Interview guideline (to NGO managers)

Questions about implementation of contracting project by NGO Contractors

1. Process of sub-contracting

1.2 Contracting with individual health workers

- What are performance targets for each staff?

1.3 Introduction of contracting out/performance-based payments (concept) to health workers

Please describe how did you introduce the concept of contracting out to individual staff?

2 Performance-based payments

- What is achievement by HCs monthly?

- What is lowest performance, highest performance and the average?

- What are your comments about cases of failure of HCs to achieve the target (reduction of payment, response of health workers)?

3. Details of the internal rules and monitoring relating to performance-based payments

Please describe .

4 Issues of low performance and measures for improving them

(1) What are Issues?

(2) What are enhancing management capacity by the NGO contractors?

Interview guideline

Questions to MOH about the contracting project (Example 1)

1 Bidding by NGOs

1 What are formation and number of NGO staff in the proposal by the NGO bidders?

2. What are processes of bidding and characteristics and main components of TOR?

3. What are laws governing relations between government health workers and NGO?

4 What are types and mechanism for staff payments (pilot project and the project)?

5. What is status of government health staff?

6. What are rules, punishment, solution mechanism for problems of performance of government health staff?

7. What are advantages of being government staff (not moving to the private sector)?

8. Other information (about the district not contracted out)

What are your comments about possible districts suitable for the quasi-experimental design of this study?

(similarities in socio-economic aspects, physical accessibility, accessibility to health workers in the districts through the Provincial Health Department and the (health) District Office)

2005

Interview guideline

Questions to MOH about the contracting project (Example 2)

1 Monitoring structure

Please describe the monitoring structure and the following specific aspects of the monitoring concerning the contracting project.

1. 2. MOH Routine Monitoring

Please describe

(1) Methods: (2) Duration:

(3) Team: structure

(4) The base-line indicator

(5) Report

(6) Who design the monitoring approach?

(7) Learning from monitoring, issues

1.3 Advantage of the monitoring

What are your comments about advantage of the monitoring concerning the performance and compliance?

2. Views toward monitoring by NGO

What are your comments about monitoring by NGO?

3 Staff performance management.

(1) What are number of staff deployed? What percentage of required number was fulfilled?

(2) What are methods/elements of staff management which seem to raise their performance including performance-based payment?

2005

Interview guideline

Questions about implementation of contracting project by NGO Contractors No. 1 (NGO managers)

1. Reason for entering the contract relations with MOH

(1) Please describe reasons for entering the contract relations with MOH, objectives of NGO contractors in the contracting.

(2) Formation/organisational arrangement of the implementation

Please describe Formation/organisational arrangement of the implementation

(staff of NGO in the district, national or international, skill types of staff, etc.)

2. Districts responsible for

Please describe:

1) Area and locations

(distance and hours from Phnom Penh, main means and issues for transportation)

2) Socio-economic features

(the economic level, markets, road conditions and other basic infrastructure, main economic activities, educational level, ethnic compositions, etc.)

3) Health services

General conditions (diseases, health awareness, staff deployment, health facilities)

3. Staff situation

Please describe the following points about government health workers working for the contracting implementation.

- Status, government salary, dual practice (frequency, income earned), working hours, motivation, changes in performance in the course of implementation)

4. Dual practice

Please describe the following and what are your comments about:

1) Practices, types
2) Rules of prohibition applied by the NGO
3) Compliance
4) Enforcement measures
5) Disciplining Cambodian health staff
6) Issues?

5. Types of payments to health workers
What types of payments do the workers receive?

What are your comments about:
1) Basic salaries
2) Performance-based-payment
3) User-fees
4) Other payments

6. Relation between the project implementation and the Provincial Health Department
What are your comments about:

7. Institutional issues for the contracting project concerning MOH and supporting donors
What are your comments about?

8. Possible MOH Depts.or Organisation which may provide useful information for this study

9. Other information:
What are your comments about differences in implementation of contracting out between your NGO and other NGO Contractors (main emphases or characteristics of the NGO Contractors and other NGO Contrators)?

10. Other information (about the district not contracted out)
What are your comments about possible districts suitable for the quasi-experimental design of this study?

(similarities in socio-economic aspects, physical accessibility, accessibility to health workers in the districts through the Provincial Health Department and the (health) District Office)

Interview guideline

Questions to managers of NGOs working in the Cambodian health sector about the contracting project and government health workers' income (Example 2)

1. The contracting out project in relation to its high evaluation of raising performance of health workers.

What are your comments about the contracting out project in relation to its high evaluation of raising performance of health workers. What made you have the view?

2. Performance-based payments (effectiveness, amount, etc.)

What are your comments about performance-based payments (effectiveness, amount, etc.)?

3 Health workers' income obtained in the government sector and implication to them

- What are your comments about government regular payments?

- What are your comments about supplementary salaries and per-diems?

- What are your comments about relative importance of these incomes to the health workers?

4. Dual practice

- What are your comments about level of private practice among them?

- What are your comments about income from dual practice?

- What are your comments about prohibition of dual practice by the government regulation and effectiveness?

5. Income from other than dual practice

- What are common economic activities by household of health workers?

6. Reasons for government health workers' retaining in the government sector

What are your comments about reasons for government health workers' retaining in the government sector?

7. Districts selected as the subject of this study
(The treatment : Peareng, Preah , Kirivong, the control: Kamchay Mea, Mesang).

What are your comments about:

- Socio-economic feature

- Health issues-

- Health system issues.

- Previous experiences of health development project

Appendix 3: Sections and sub-sections of CSES 2004 (Source: MOP 2004)

Foot Note : Basic household information

List of household members

Summary of presence in the household

Information on migration

Food consumption during the last 7 days (recall method)

Education and literacy

Housing

Household economic activities

Land ownership

Production of crops

Cost of cultivation

Hypothetical questions on rental and sales market

Input and output from livestock raising activities

Input and output from fish cultivation

Input and output from forestry and hunting

Inventory of household non-agricultural economic activities during the past 12 months

Household liabilities

Household income from other sources

Durable goods and other expenditures (partial non-food recall)

Construction activities in the past 12 months

Nutrition

Fertility and child care

Fertility history

Child feeding and vaccinations

Mortality

Health check of children

Current economic activity

Activity status during the past 7 days

Main occupation during the past 7 days

Employment and earnings during the last 12 months

Health

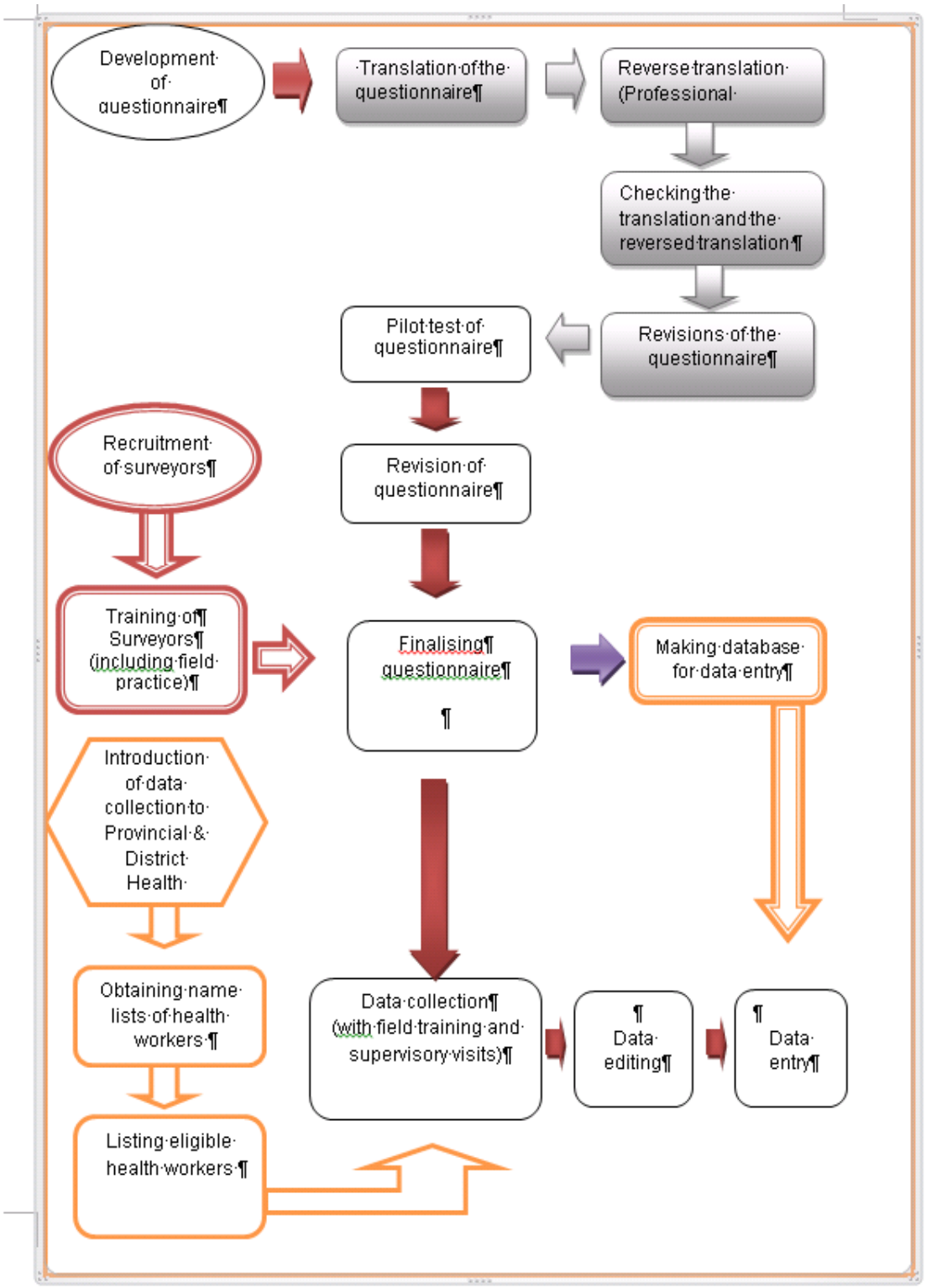
Illnesses during the past 4 weeks

Smoking

HIV/AIDS

Victimisation

Appendix 4: Flow of processes of field work



Appendix 5: Recruitment and training of surveyors

(1) The locations of the announcement of the recruitment of surveyors

CEDAC, Cooperation Committee for Cambodia (an umbrella and membership organisation of the NGO sector in Cambodia), Royal University of Phnom Penh, University of Health Science, Royal University of Agriculture, Royal University of Law and Economic, National University of Management, Prekleap National School of Agriculture, Build Bright University.

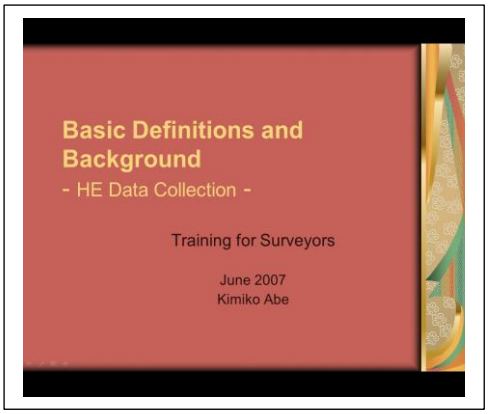
(2) Content, trainer, and training of surveyors

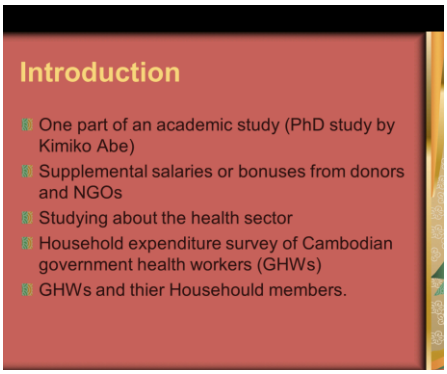
Table 8A.1: Content, trainer, and training of surveyors

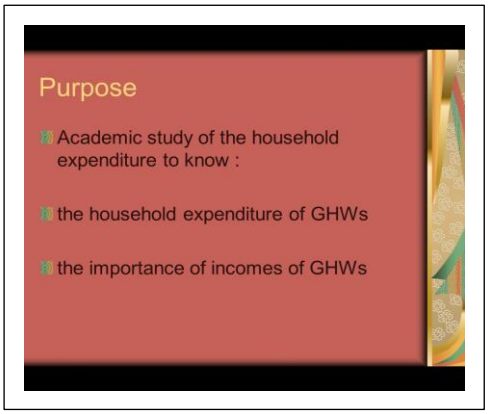
Content	Trainer
Introduction of this study, the concepts of the household survey of this study, the concepts of sections of the questionnaire	The investigator
Rural livelihood, the agricultural sector, household enterprises (especially focusing on the household money flows	Project manager
Tips and rules of taking the survey	The investigator
Sharing field experiences (rural livelihood, socio-economic household survey)	The field supervisor, the Field Editor
Practice (taking the survey of food expenditure, money flows of enterprises)	The investigator

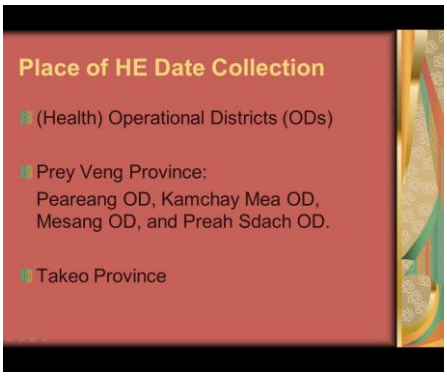
Place of the field practice: a health centre of Muk Compuil Operational District in Kandal Province

(3) Training materials (presentation sheets for training)

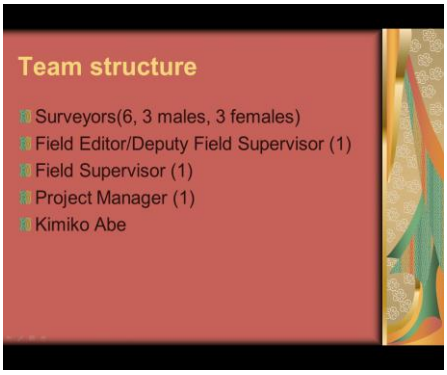

Basic Definitions and Background
- HE Data Collection -
Training for Surveyors
June 2007
Kimiko Abe

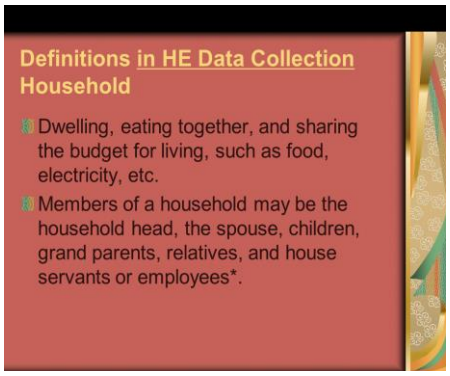

Introduction
One part of an academic study (PhD study by Kimiko Abe)
Supplemental salaries or bonuses from donors and NGOs
Studying about the health sector
Household expenditure survey of Cambodian government health workers (GHWs)
GHWs and thier Household members.

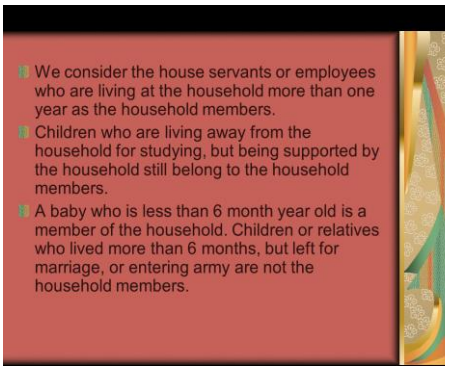

Purpose
Academic study of the household expenditure to know :
the household expenditure of GHWs
the importance of incomes of GHWs

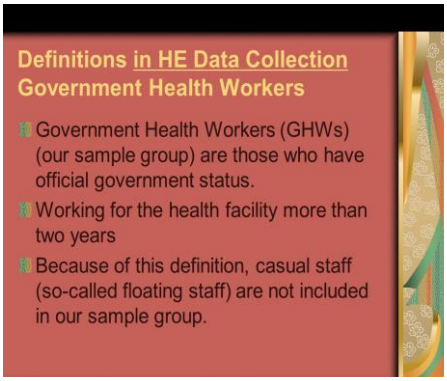

Place of HE Date Collection
(Health) Operational Districts (ODs)
Prey Veng Province:
Peareang OD, Kamchay Mea OD, Mesang OD, and Preah Sdach OD.
Takeo Province

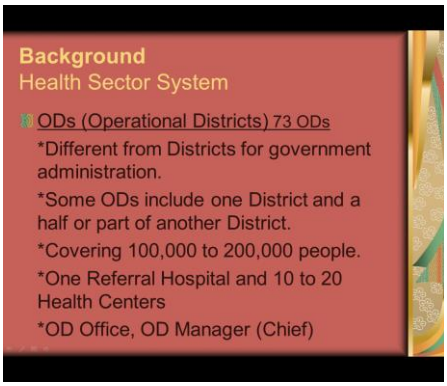

Time of HE Date Collection
From mid-June to mid-July
Training: 12th to 15th of July
Field work:18th of July
Peareng, Kamchay Mea, Mesang, Preah Sdach, Kirivong
Possible time for one OD=6 days

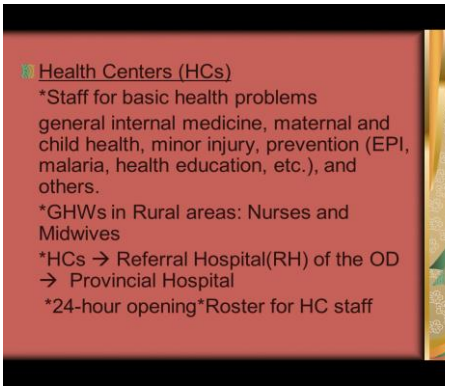

Team structure
Surveyors(6, 3 males, 3 females)
Field Editor/Deputy Field Supervisor (1)
Field Supervisor (1)
Project Manager (1)
Kimiko Abe

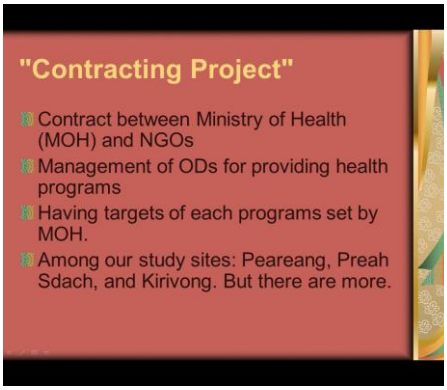

Definitions in HE Data Collection
Household
Dwelling, eating together, and sharing the budget for living, such as food, electricity, etc.
Members of a household may be the household head, the spouse, children, grand parents, relatives, and house servants or employees*.


We consider the house servants or employees who are living at the household more than one year as the household members.
Children who are living away from the household for studying, but being supported by the household still belong to the household members.
A baby who is less than 6 month year old is a member of the household. Children or relatives who lived more than 6 months, but left for marriage, or entering army are not the household members.


Definitions in HE Data Collection
Government Health Workers
Government Health Workers (GHWs) (our sample group) are those who have official government status.
Working for the health facility more than two years
Because of this definition, casual staff (so-called floating staff) are not included in our sample group.


Background
Health Sector System
ODs (Operational Districts) 73 ODs
*Different from Districts for government administration.
*Some ODs include one District and a half or part of another District.
*Covering 100,000 to 200,000 people.
*One Referral Hospital and 10 to 20 Health Centers
*OD Office, OD Manager (Chief)


Health Centers (HCs)
*Staff for basic health problems
general internal medicine, maternal and child health, minor injury, prevention (EPI, malaria, health education, etc.), and others.
*GHWs in Rural areas: Nurses and Midwives
*HCs → Referral Hospital(RH) of the OD → Provincial Hospital
*24-hour opening*Roster for HC staff


"Contracting Project"
Contract between Ministry of Health (MOH) and NGOs
Management of ODs for providing health programs
Having targets of each programs set by MOH.
Among our study sites: Peareang, Preah Sdach, and Kirivong. But there are more.

GHWs in rural areas

- Nurses or midwives
- Primary and Secondary (e.g. Primary Nurse, Secondary Nurse).
- Very little number of Secondary Midwives
- OD Manager may be only one Doctor in the OD

Knowledge about GHWs

- Kinds of incomes
  *Government monthly salary according to their positions, qualification, etc.
  * Allowances (not necessary receiving all): location of their health facilities (remote or not), housing allowance.
  * Sharing the income from User-fees

- Others
  *Supplemental fund (donors, NGOs)
  *Performance-Based-Payment (PBP) : based on performances. Indicators (immunization, hygiene in the health facility, absence, punctuality=not late). Only limited ODs.
  *Per-diem for their attending training, etc.
  *Some GHWs: for their providing health services at own clinics or maternal centers/clinics, or their home, or visiting patients' home)
  *Honorarium for giving lectures or training

Possible income sources of HH member of GHWs in rural areas

- Household members may be government officials, or teachers, or business people, or having a pharmacy or a small shop, or farmers.
- Different sources of income of different GHWs' households.
- Household members put their income in the household budget for their living: eating, purchasing cloths, having education or health services, etc.

Appendix 6

Identified cases by the matching cases between CODs and MODs for regression analyses (Chapter 4)

The processes and result of the matching by controlling for major characteristics were described in Chapter 4. Here, additional descriptions about the number of cases caught by the criteria are presented.

The attributes applied for matching were:

- Gender,
- Age generations (their 20s, 30s, 40s and 50s)
- Number of their household members (one to ten) (Table x)
- Marital status

The number of primary nurses who fulfilled these criteria was 28 (17 of 48 male primary nurses in CODs, 11 of 44 male primary nurses in MODs). If the number was balanced between CODs and MOD, the total became 22 (11 from each status of district).

Secondary nurses who fulfilled these criteria numbered 29 (19 of 42 male secondary nurse in CODs, 10 of 17 male secondary nurses in MODs). If the number was balanced between CODs and MOD, the total became 20 (10 from each status of district).

Appendix 7

Modified version of the White test for heetroscedasticity in regression models

SPSS does not have the White test which tests the hetroscedasticity in the default setting. Therefore, this study employed the modified version of White test, considering the fact that the independent variables which represented by binary dummy variables in my model(s) in this study causes perfect multicollinearity in the conventional White test. The White test which hypothesised;

$e^2=c+d1\hat{y}+d2\hat{y}^2+$ error term,

here, e means residuals, c constant, d variance, ŷ all predicted values of dependent variables. d1 and d2 equal to 0 (zero).

(Economic History, History Department, Oxford University accessed April 8, 2013)

(QM1 –Session 8 Multiple Regression IIIOLS Assumptions& Effects of Violation, http://ecohist.history.ox.ac.uk/03Lecture_slides_2010/QM1_2010_11/QM1_2010week8.pdf (accessed April 8, 2013)

It was tested if there is no significant correlation of squared residual with the unstandardized predicted value. The null hypothesis states that there is significant correlation between the squared residual and the unstandardized predicted value. The alternative hypothesis states that there is no significant correlation between the squared residual with the unstandardized predicted value.

H0: Constant variance (homoscedasticity)

H1: Heteroscedasticity.

Regressing the dependent variable on all independent variables gave the unstandardized residuals and the unstandardized predicted values. Then, the unstandardized residuals were squared and regressed on unstandardized predicted values. The test gave the following statistics including the f-value of this regression.

Appendix 8: Methods for exploring the variables which brought about the bimodality the most largely in the residual plot and analyses

residual plot (Chapter7) and analyses

The following methods were employed to confirm that COD was the main factor which caused the bimodality presented in the residual plots in regression diagnostics (Chapter7). After explanation of the method, two examples of analyses employing the method were presented.

1. Checking the dependent variable concerning the difference between CODs and MODs

For the dependent variables, the mean, the median, and the standard deviation were compared between CODs and MODs. Differences in these statistics were described in Chapter 6 and 7.

Next, patterns of the distribution of dependent variables of cases in CODs and in MODs were compared in the form of two separate histograms; one of CODs and of MODs.

2. Checking the independent variables for their influence to the bimodality

Following the checking of the dependent variable, a univariate regression of the logged dependent variable in each of the models was conducted, applying each of the independent variables of the model. From this regression, plots of dependent variables (Y axis) versus standardized predicted values (X axis) (Type A plot) as well as plots of dependent variables (Y axis) versus standardized residuals (X axis) (Type B plot) were produced.

First, only the COD variable was examined (in case of Model 3, instead of COD, the dummy

variables expressing individual Operational Districts. They were Peareang, Preah Sdach, Kirivong and Mesang Operational Districts, with Kamchay Mea as the reference variable). Then, COD and another independent variable (Group A Model 1 and 2) were applied (in case of Model 3, instead of COD, the dummy variables expressing individual Operational Districts and another independent variable).

All plots in each type were visually compared with the plots produced from the regression which had only COD, and compared each other among themselves, The comparison checked whether COD was the main factor which caused the bimodality and whether the paired independent variable enhanced or reduced the bimodality in relative to the other independent variables paired with COD. Next, among the independent variables except COD, the order of their influence to the bimodality was decided.

Next, according to the order, the independent variables, starting from the lowest influence were added one by one to regressions of the dependent variable. At each addition, the two types of plots which explained above were produced. These plots were checked as to whether the addition presented or enhanced bimodality. If presented, checking was conducted to know which independent variable also caused the bimodality. Then, degree of influence of the specified variables was compared with that of COD.

3 Example of the analyses of variable's influence on bimodality in the residual plots.

Regression models, definitions and expressions of independent variables were presented in Chapter 4. Note: Plots and descriptions of test results on other dependent variables and other groups of cases can be provided by the investigator upon request.

Example 1[23]

1. Checking the dependent variable concerning differences between CODs and MODs

Dependent variable: income from health work excluding private practice

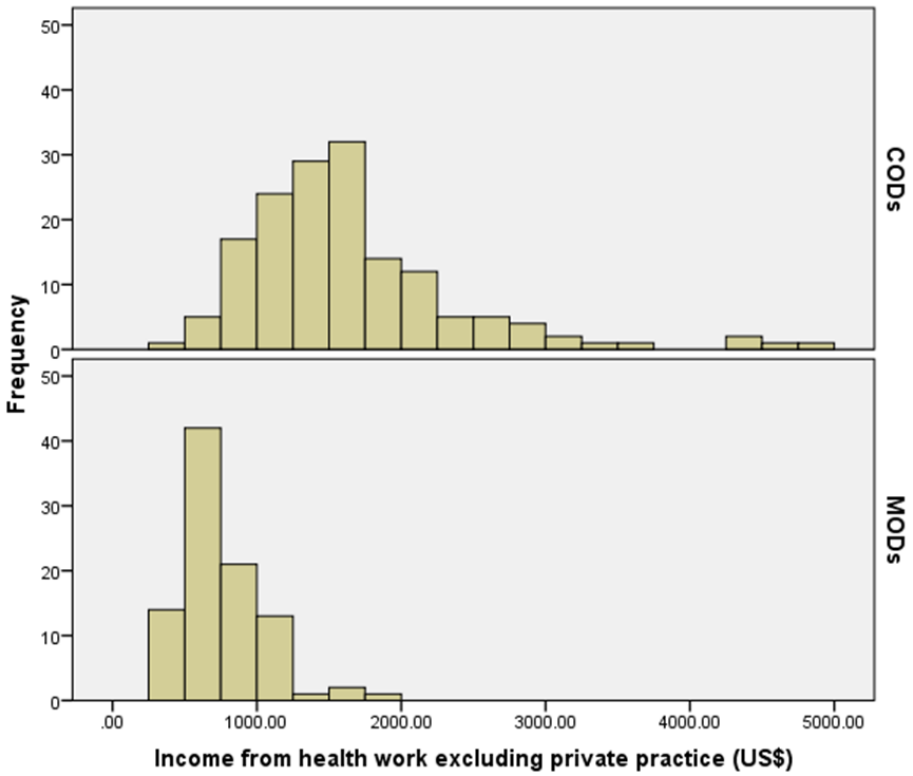
Cases: All health workers (N=250), Model 1 to 3

Results from descriptive statistical analyses of the dependent variable were investigated between CODs and MODs. The mean and median of the income in CODs were higher than in MODs. The standard deviation in CODs were higher than in MODs.

As seen in 1.1, histograms of the income shown below appeared to indicate a difference in the distribution of the cases between COD and MOD. In most cases the incomes in CODs had higher values than cases in MODs. The two histograms had own peak at different amount of the incomes; cases COD cases at higher amount than MOD cases.

1.1 Distribution of dependent variable

[23] As noted in previous text above, plots and descriptions of test results on other dependent variables and other groups of cases are provided by the investigator upon request to the investigator.



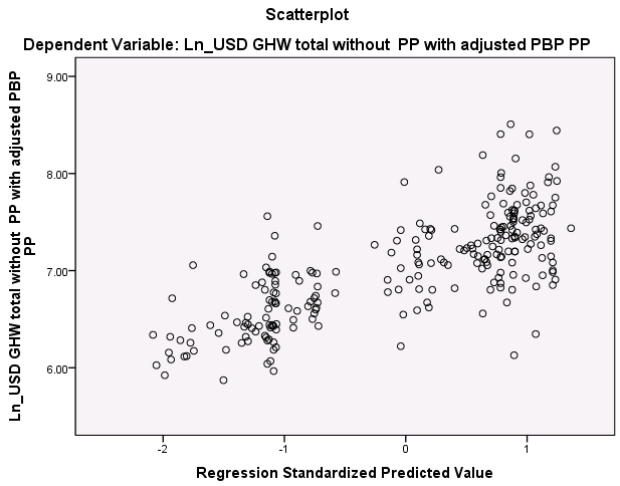
2. Checking the independent variables for their influence to the bimodality (Model 1 to 3)

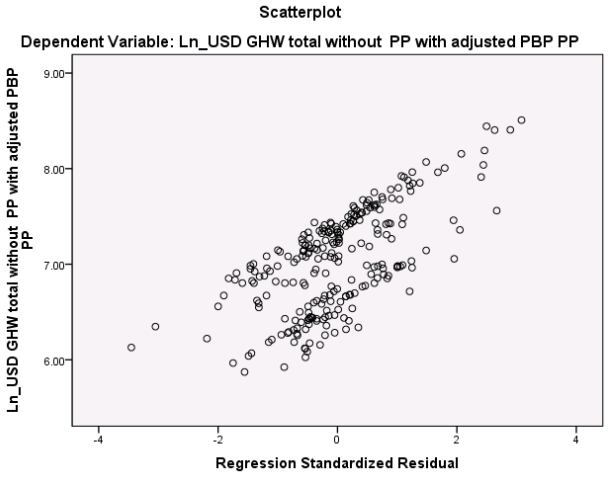
[Model 1]

2.1 Regression on all independent variables

Independent variables: Age, Age Squared, Cadre, Married, Male, Economic Status, COD

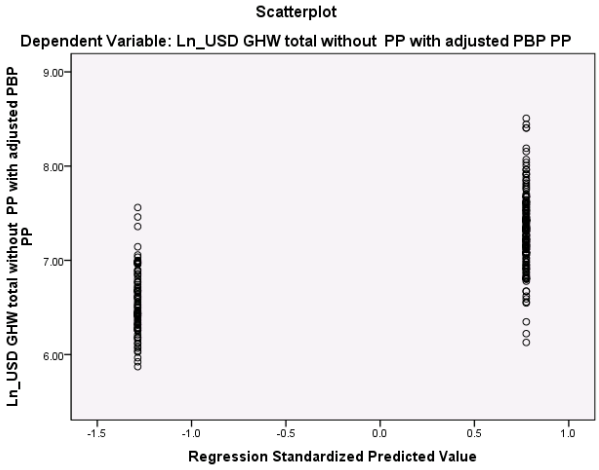
Plots from this regression were shown below.

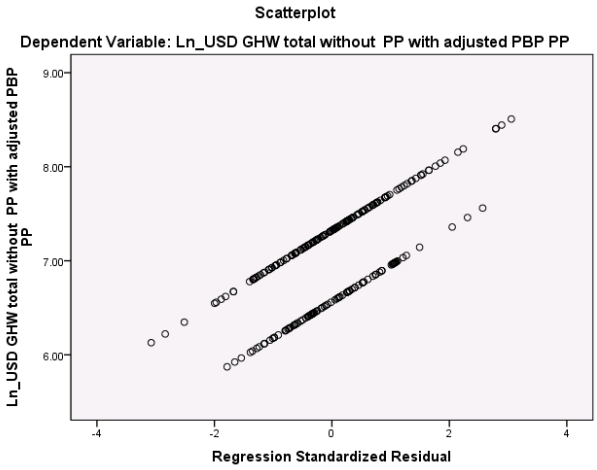




2.2 Regressions only on COD (binary dummy variable)

Plots from this regression were shown below.

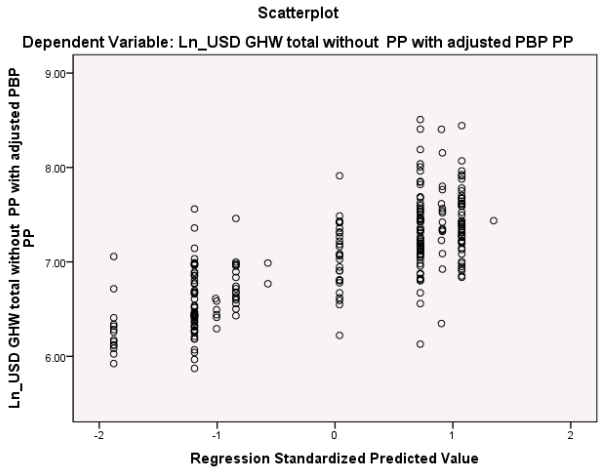


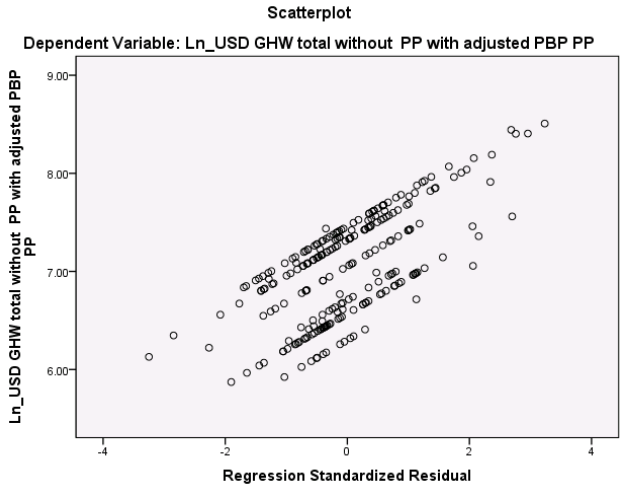


2.3 Regression on pairs which consisted of COD and another independent variable

1) COD and Cadre (plots from this regression were shown below)

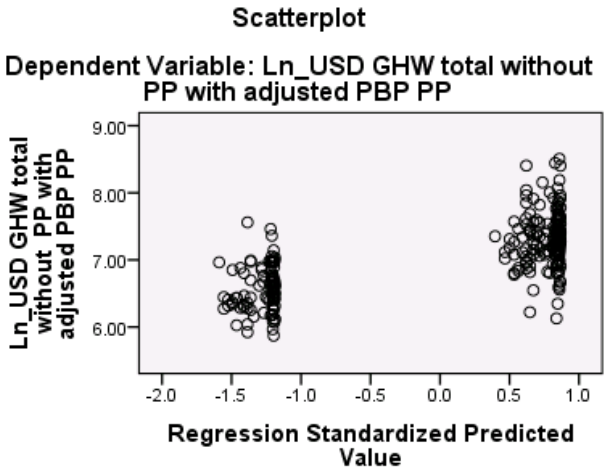
The plots appeared to maintain the bimodality which were to be attributable to COD. However, with each group, Cadre, the variables, appeared to divide the cases.

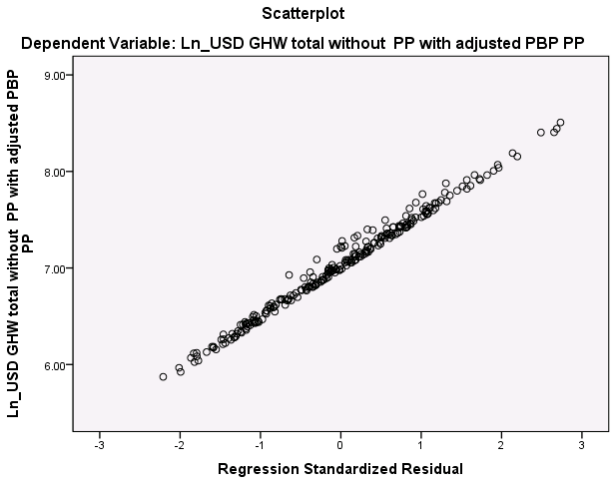




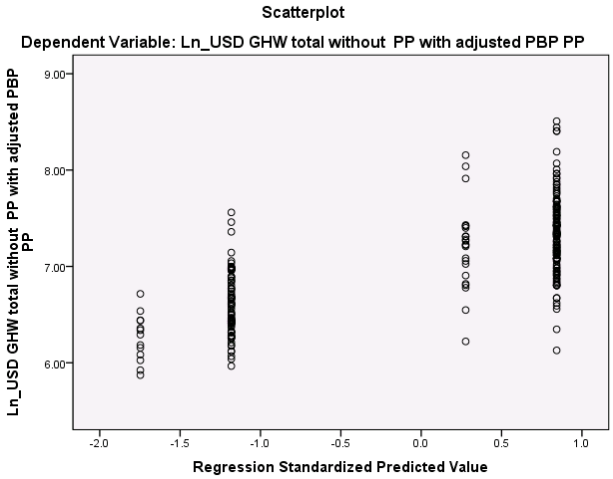
2) COD, Age and Age Squared (plots from this regression were shown below)

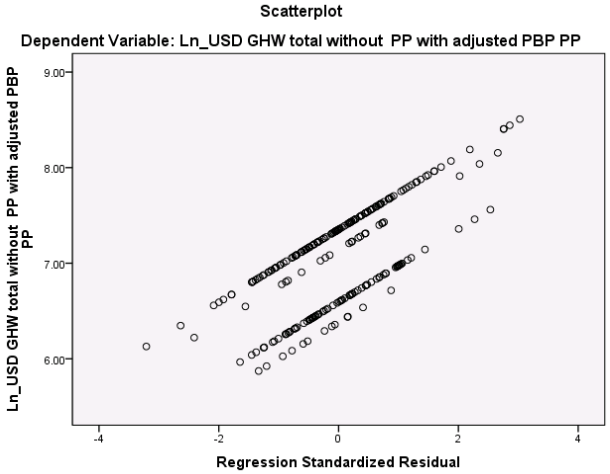
Age and Age Squared were put in together with COD. The plots below appeared to maintain the bimodality presented in the plots of the regression only on COD. However, Age and Age Squared appeared to spread plot points in a semi-circular.



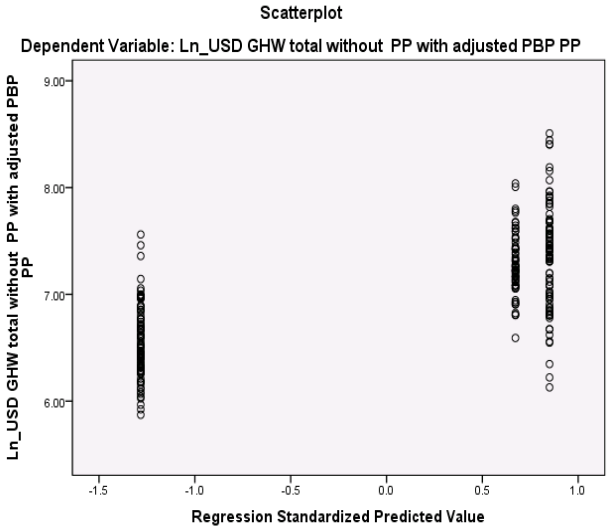


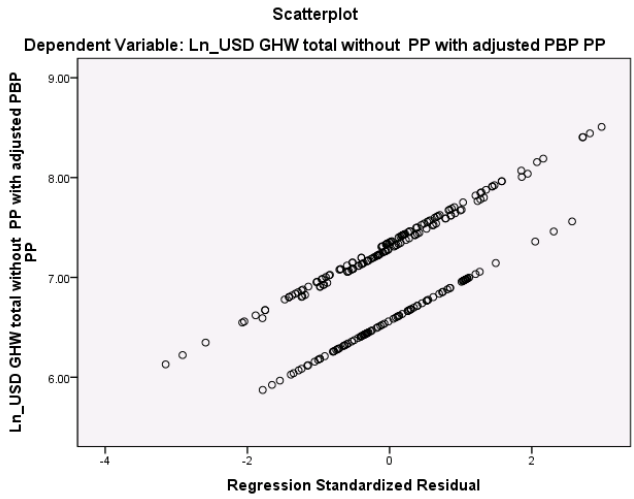
3) COD and Married (plots from this regression were shown below)



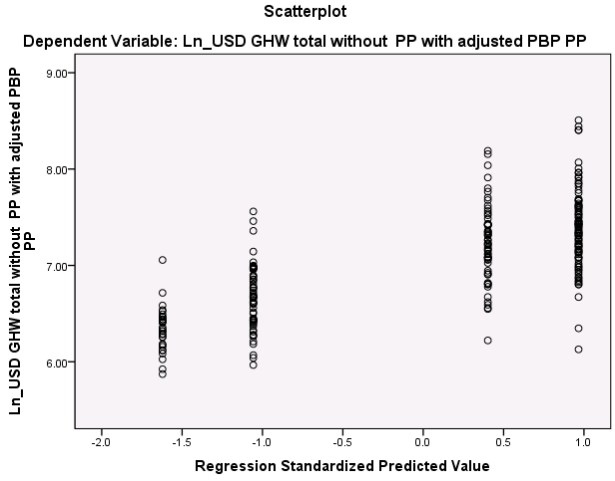


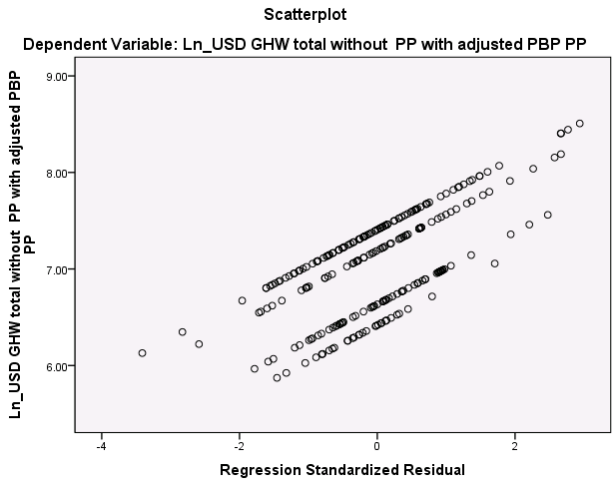
4) COD and Economic Status (plots from this regression were shown below)





5) COD + Male (plots from this regression were shown below)



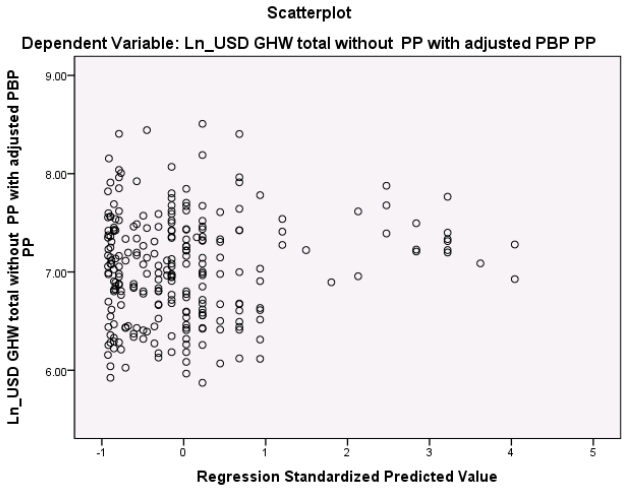


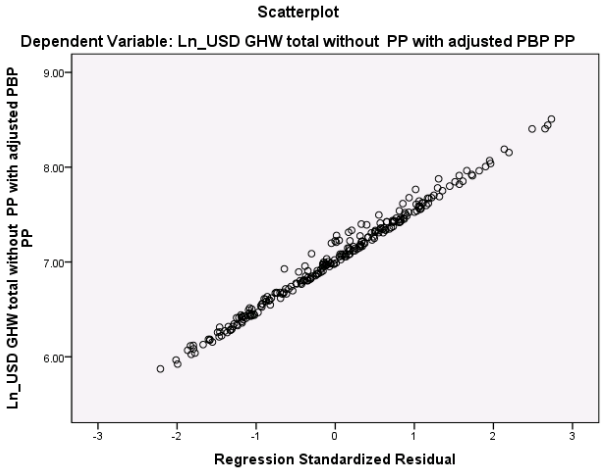
The order of approximate influence of each independent variable to the bimodality was estimated from the plots. The order was, from the weakest, Age, AgeSquared, Cadre, Male, Married and Prohibition dual practice Mid, Prohibition dual practice low, and COD.

2.4 Adding independent variables, one by one, according to their approximate influence to the bimodality (plots from this regression were shown below)

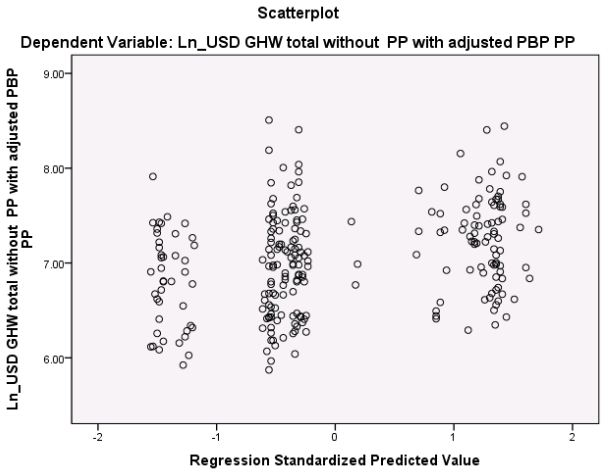
Additions of the independent variables confirm that COD was the main factor that caused the bimodality. The pairs of plots from five regressions below before adding COD appeared not to present bimodality but presented marginal heteroscedasticity.

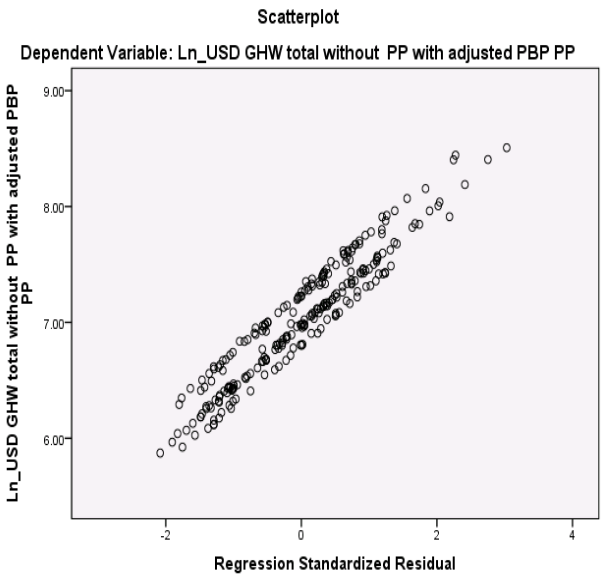
1) Age + Age Squared



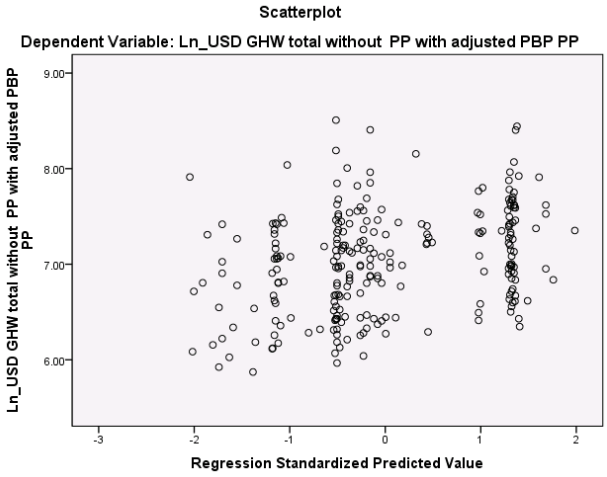


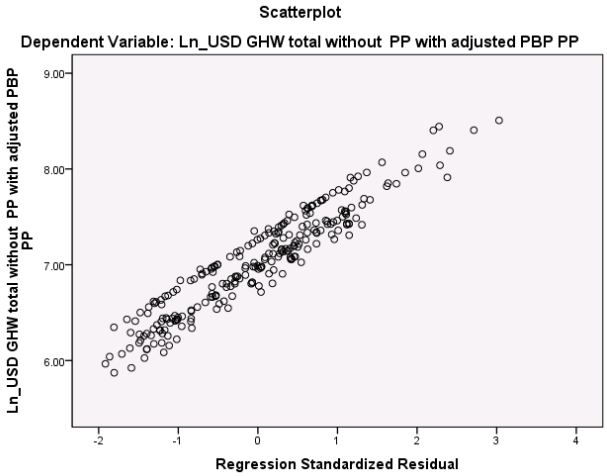
2) Age + Age Squared + Cadre



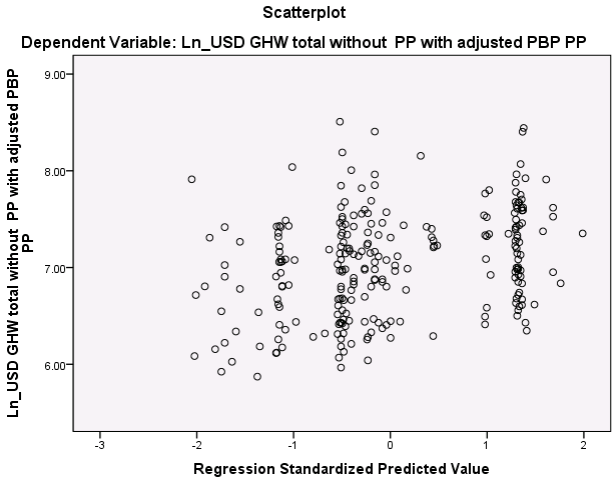


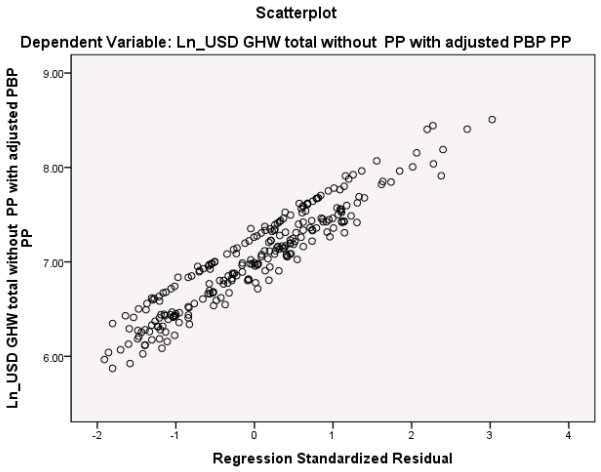
3) Age+ Age Squared + Cadre + Married



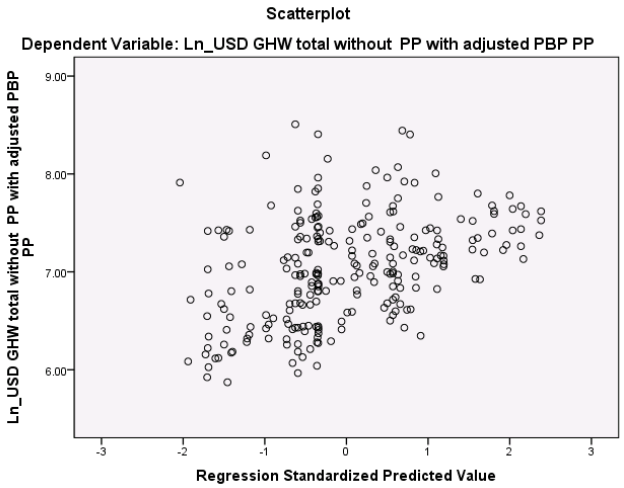


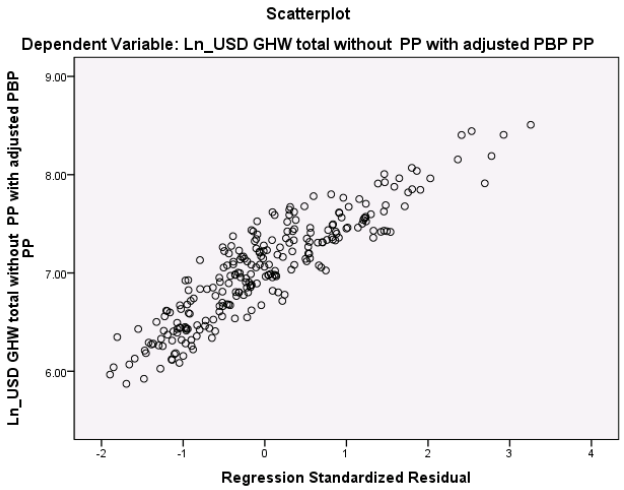
4) Age + Age Squared + Cadre + Married + Male



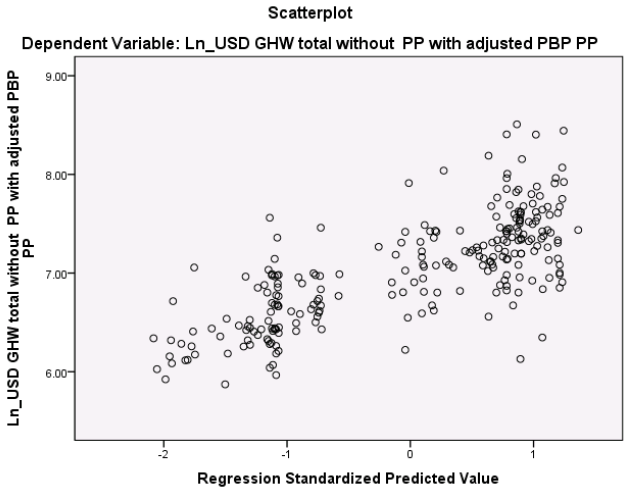


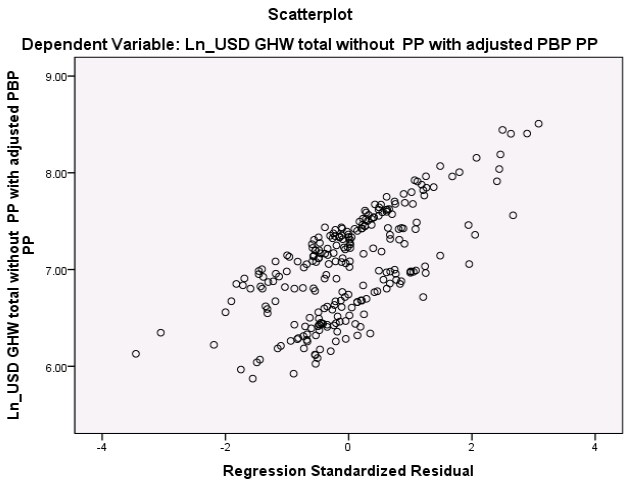
5) Age + Age Squared + Cadre + Married + Male + Economic Status





6) Age+ Age Squared + Cadre + Married + Male + Economic Status + COD





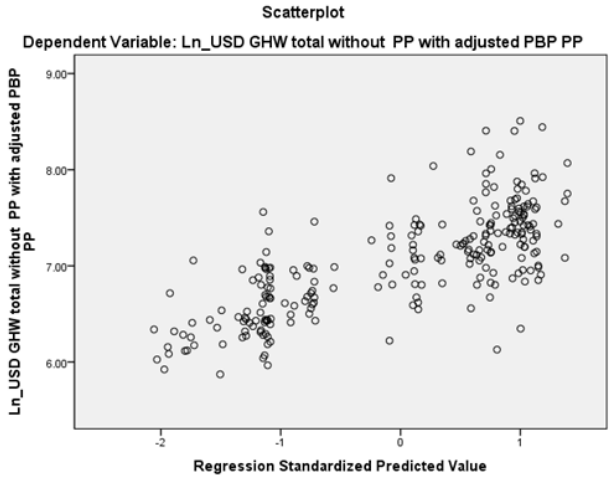
[Model 2]

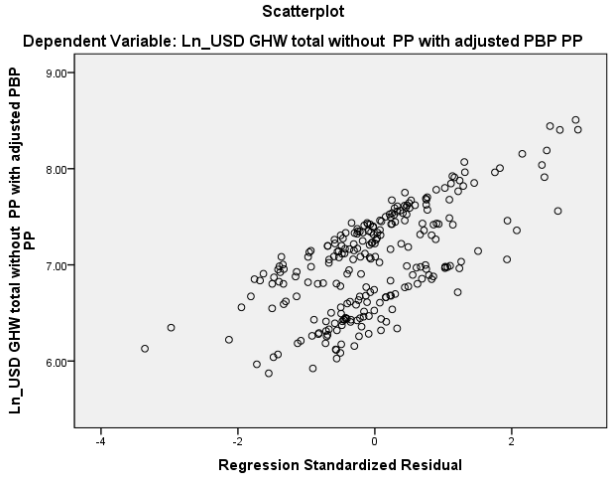
2. Checking the independent variables for their influences the bimodality

2.1 Applying all independent variables (plots from this regression were shown below)

Independent variables: COD, Age, AgeSquared, Cadre, Male, Married, Prohibition dual practice Mid, and Prohibition dual practice Low

.



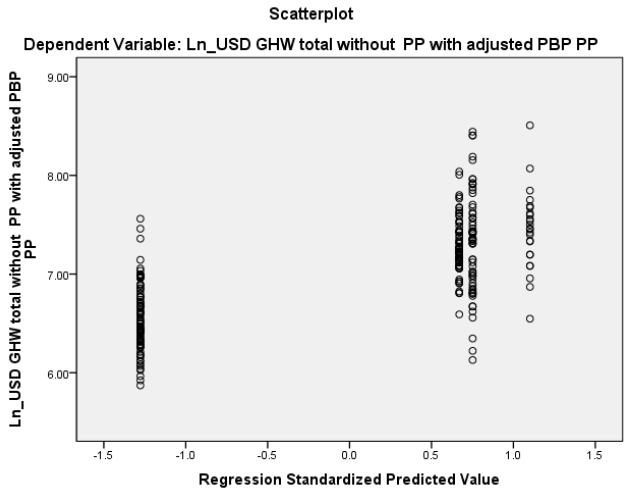


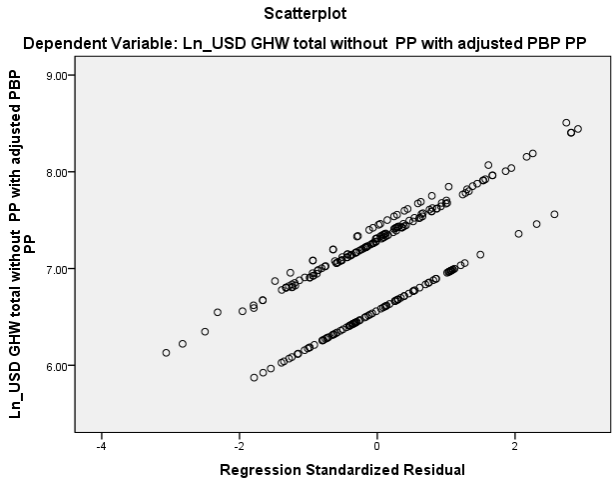
2.2 Combination of COD and another independent variable

One pair was newly created; it was the combination of COD with Prohibition dual practice Mid and Prohibition dual practice Low. All other possible combinations between CODs and the remaining independent variables in Model 2 were already examined in the test for Model 1 above.

Plots from the newly created pair indicated bimodality (plots from this regression were shown below). In the plot below, one of the two groups of cases had three groups within it, suggesting three difference feature of prohibition of dual practice among CODs.

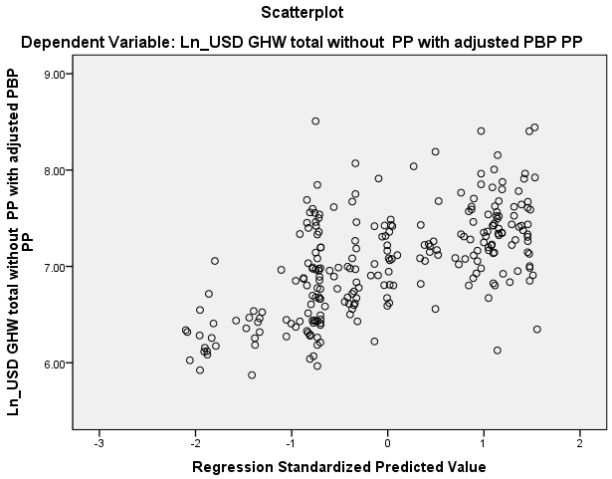
1) COD and Prohibition dual practice Mid and Prohibition dual practice Low

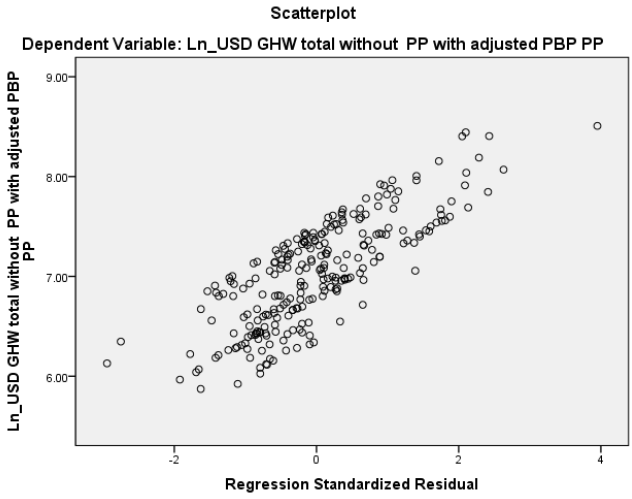




From the newly produced plots and the plots from the previous section, the order of approximate influence of each independent variable was estimated. It was, from the weakest, Age, AgeSquared, Cadre, Male, Married and Prohibition dual practice Mid, Prohibition dual practice low, and COD.

2.3 Adding independent variables one by one (plots from this regression were shown below) Next, based on the order, one new regression was performed. The regression had all other independent variables except COD (Age, AgeSquared, Cadre, Male, Married, Prohibition dual practice Mid, and Prohibition dual practice Low). From this regression, plots were produced



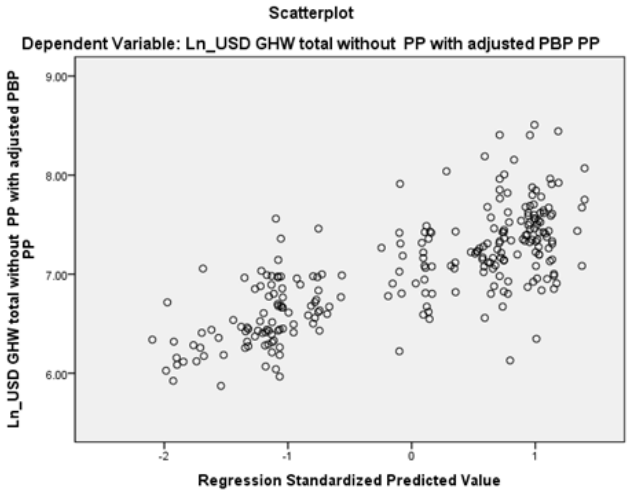


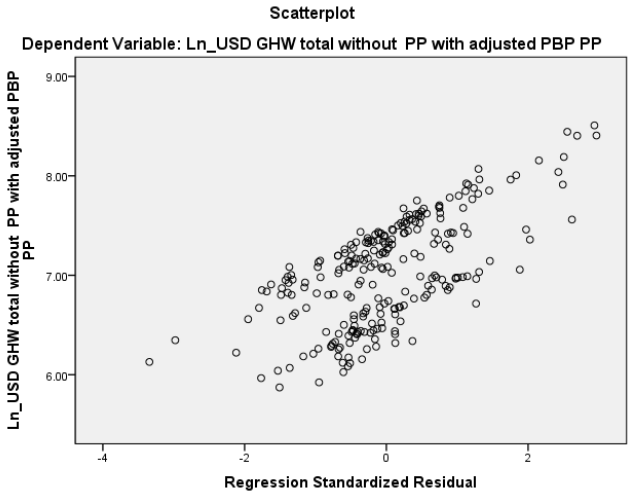
Model 3

2. Checking the independent variables for their influences to forming the bimodality

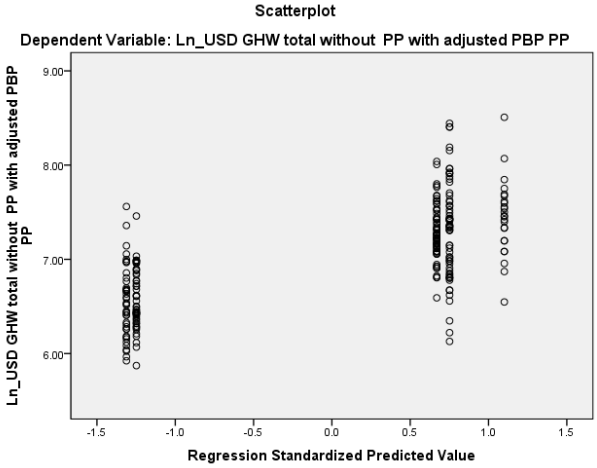
2.1 Applying all independent variables (plots from this regression were shown below)

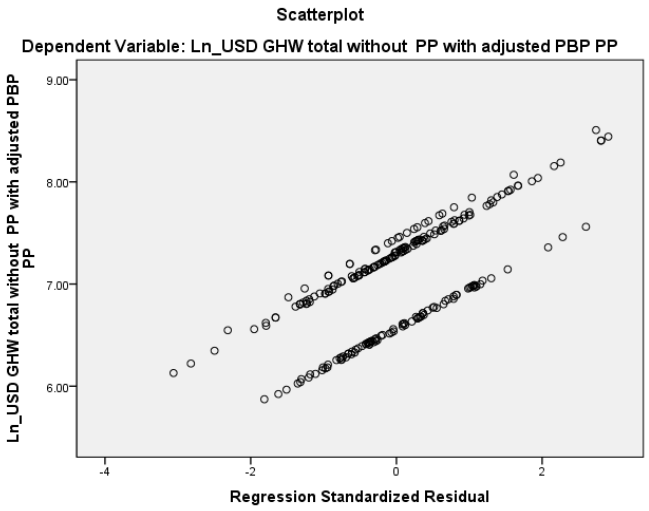
Independent variables: Age, AgeSquare, Cader, Male, Married, Individual Operational Districts (Peareang, Preah Sdach, Kirivong and Mesang) Plots from this regression appeared to indicate bimodality as below.





2.2 A new regression with only independent variable for individual Operational Districts (Peareang, Preah Sdach, Kirivong and Mesang) was performed. Plots from the regression were produced. This is because in Model 3 the variable for individual Operational Districts instead of COD was assumed to be the main cause of the bimodality since the model did not have COD.

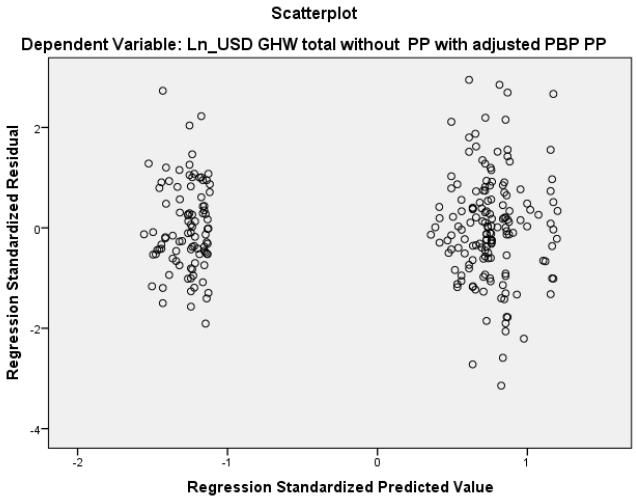


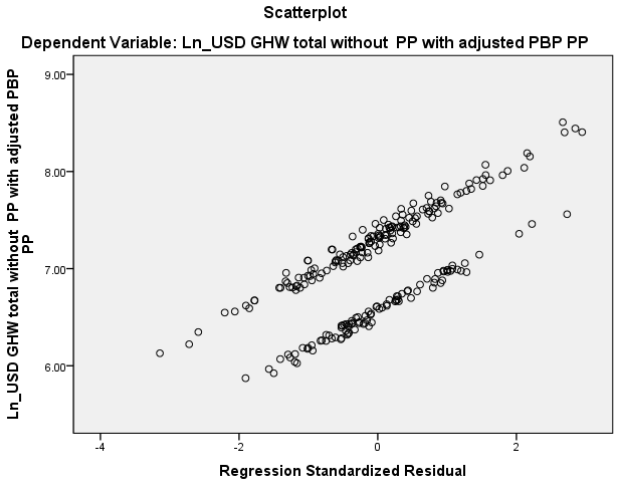


2.3 Combination of Individual Operational Districts and another independent variable.

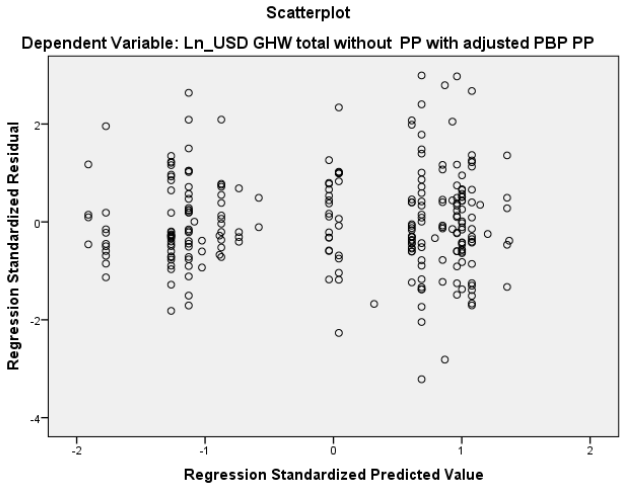
Regressions with each of the following combination of Individual Operational Districts and another independent variable used in Model 3 were performed. Plots from the regressions were produced.

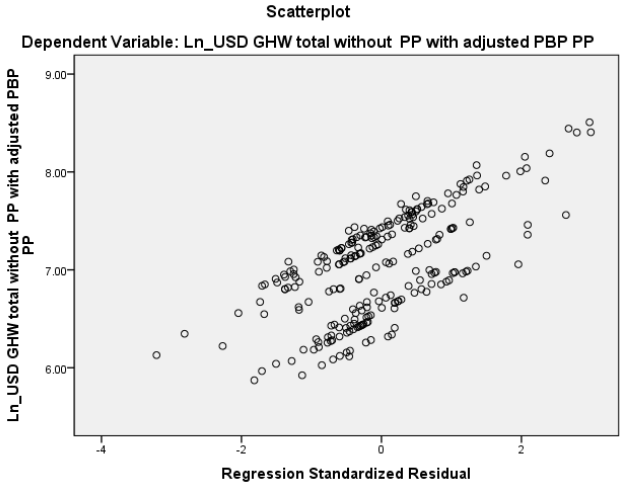
1) Individual Operational Districts, Age and AgeSquared



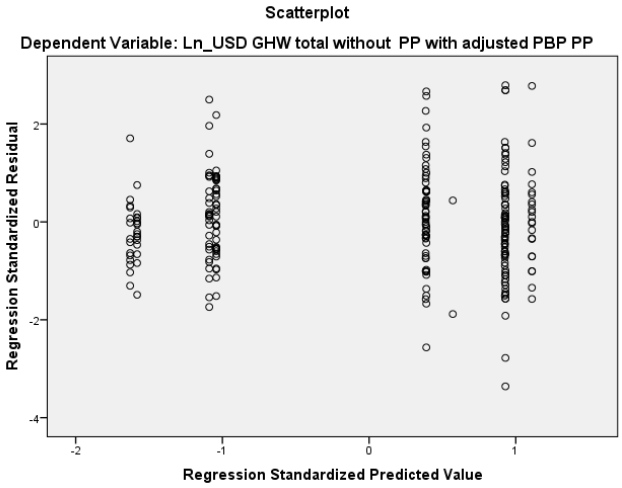


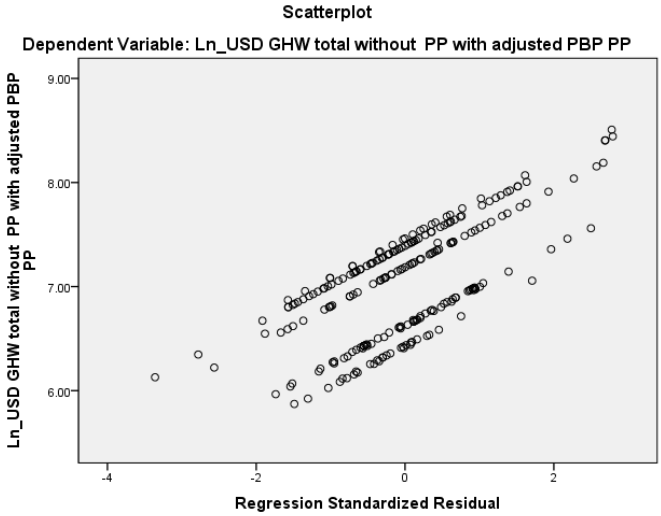
2) Individual Operational Districts and Cadre



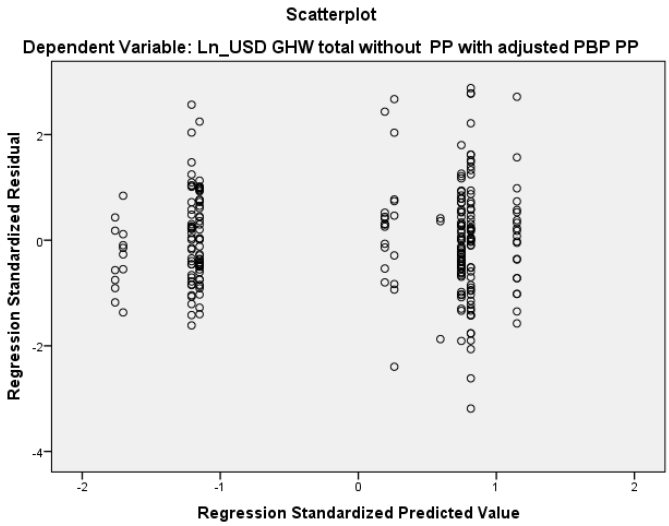


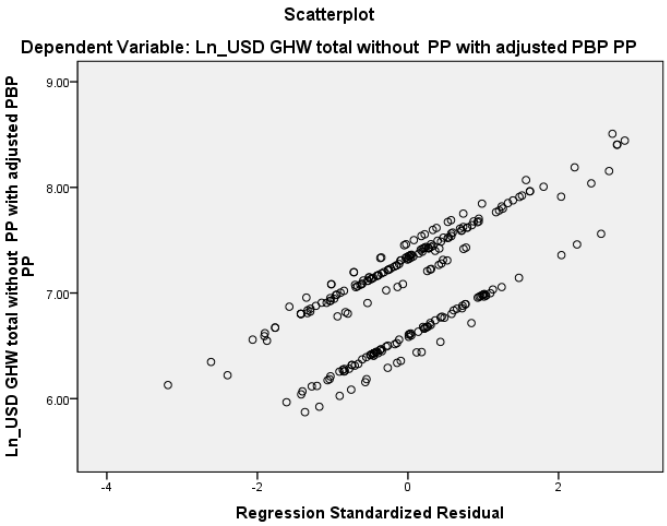
3) Individual Operational Districts and Male





4) Individual Operational Districts and Married



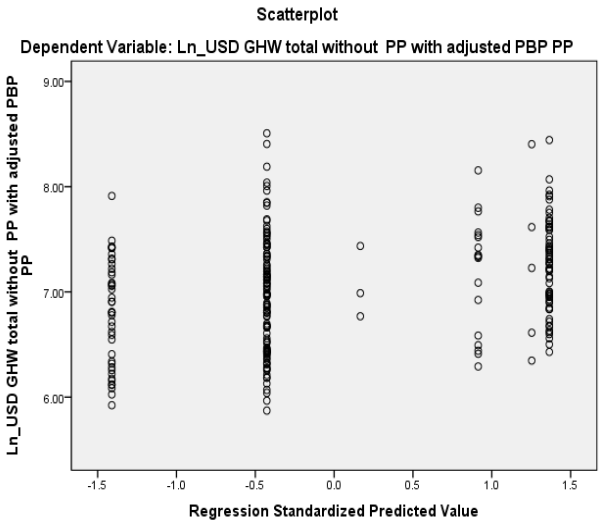


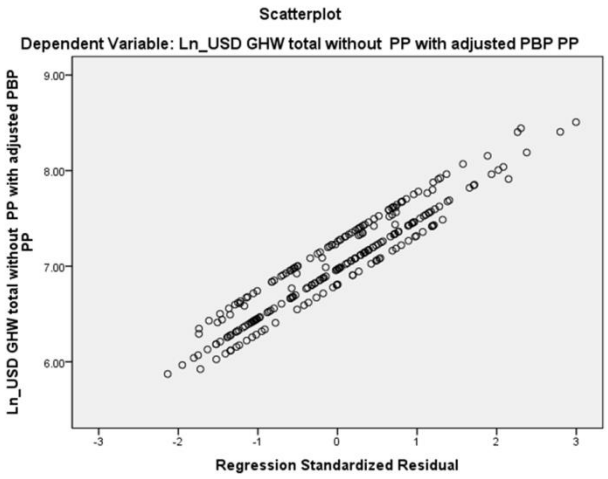
An approximate order of the influence of independent variables which might have caused the bimodality seemed to be Cadre, Age and AgeSquared (treated together), Male, Married, and Individual Operational Districts, from the lowest and the highest. Male and Married appeared to have a similar level of influence.

2.4 Adding independent variables, one by one, according to their approximate strength of influence to the bimodality

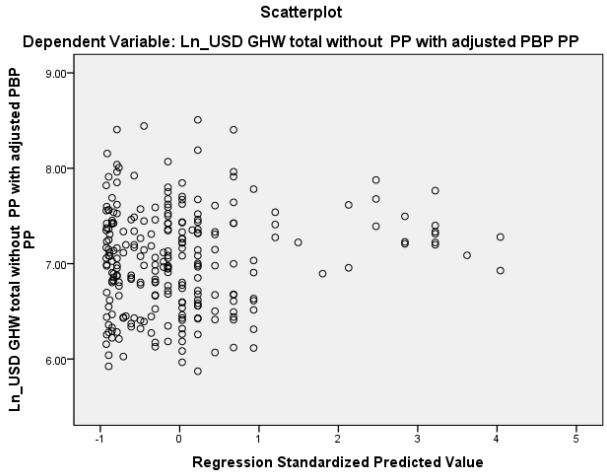
Regressions were conducted adding the independent variable one by one, according to the order estimated above.

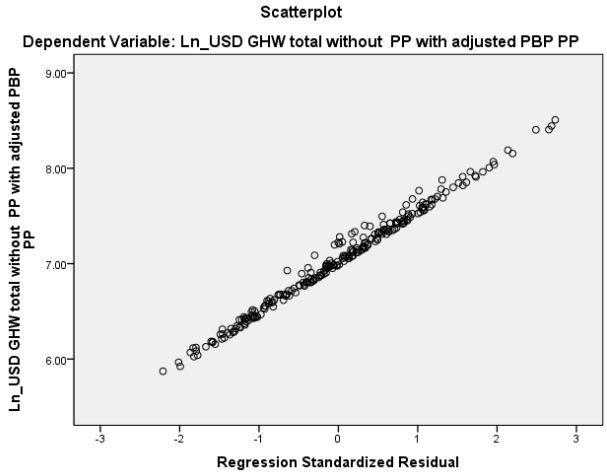
1) Cadre



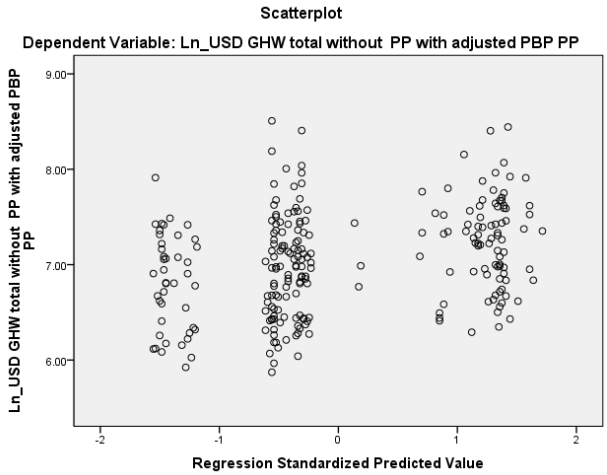


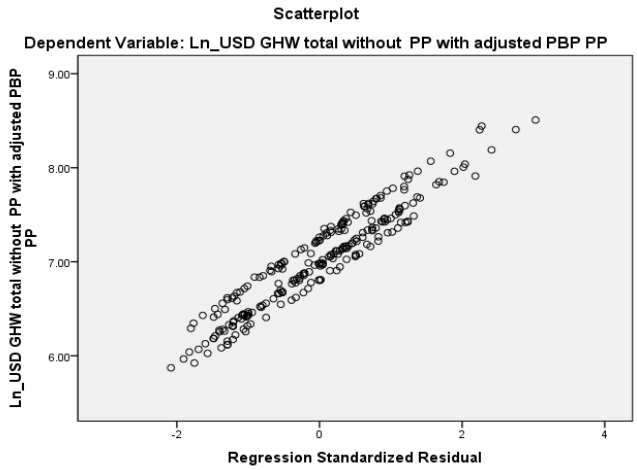
1) Age + AgeSquared



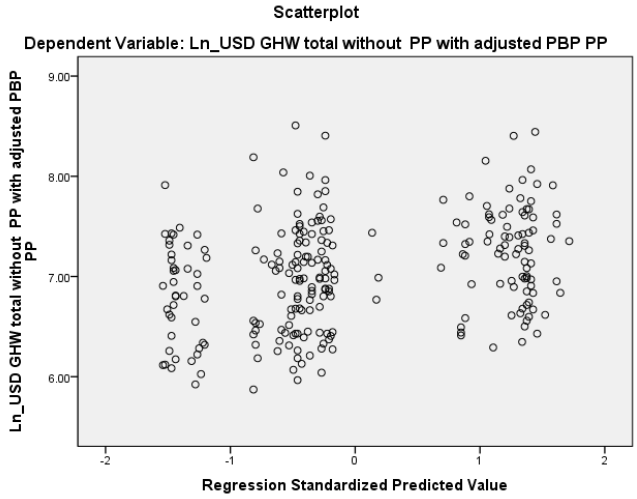


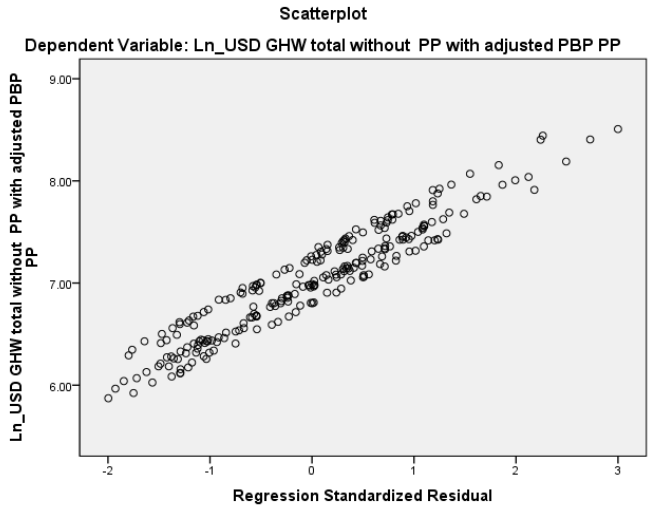
2) Cadre + Age + AgeSquare



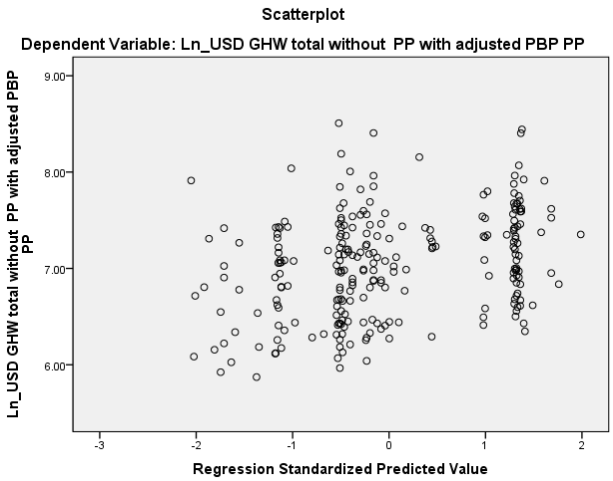


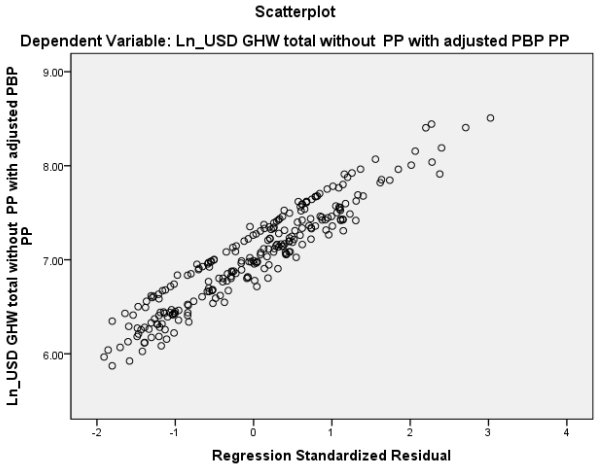
3) Cadre + Age + AgeSquare + Male





4) Cadre +Age + AgeSquare + Male + Married





Example 2

Dependent variable: Income from health work excluding private practice

Cases: midwives (N=61), Model 1 to 3

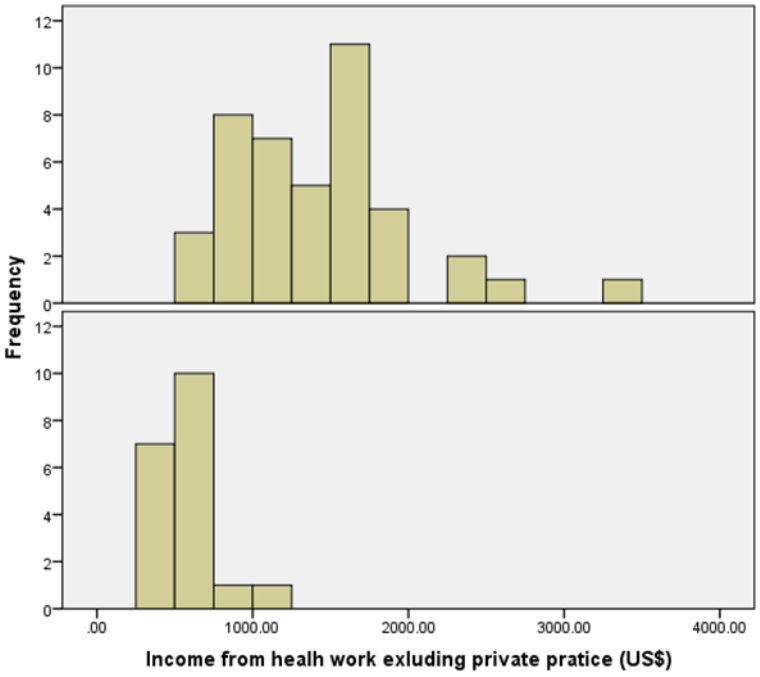
Difference between this example and the previous two examples of the test operation for COD's influence to bimodality were, first, that the variable Gender was not included in the regression for the test on midwife cases.

1. Checking the dependent variable concerning difference between CODs and MODs

Results from descriptive statistical analyses were investigated between 3 CODs and 2 MODs. The influence of COD, i.e., difference in district status as CODs or MODs appeared to be the main factor which caused bimodality.

1.1 Distribution of dependent variable

Histograms of the income, below, appeared to indicate differences in the distribution of the midwife cases between COD and MOD. Most of cases of income in CODs were spread over higher values than those in MODs, making approximately two peaks: cases in MODs at low values cases in CODs at higher values than MODs.



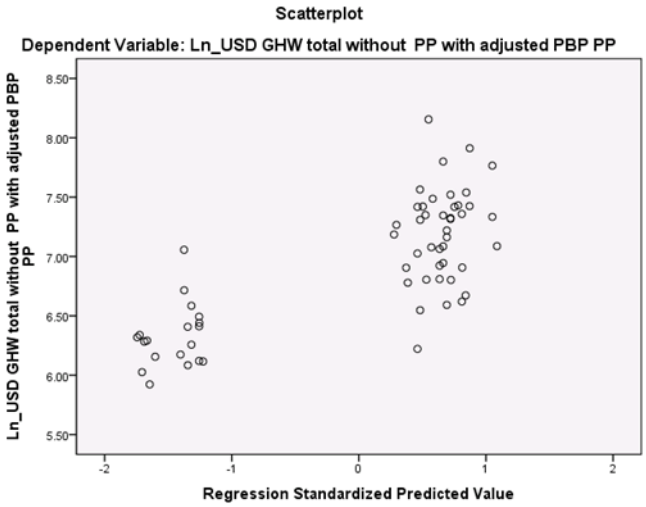
The dependent variable was investigated by Operational District with consideration to the status difference (CODs or MODs). Results of the descriptive statistical analyses indicated that the means and the medians in midwives were higher in the three individual CODs than in the two individual MODs. The standard deviation in CODs was higher than in MODs.

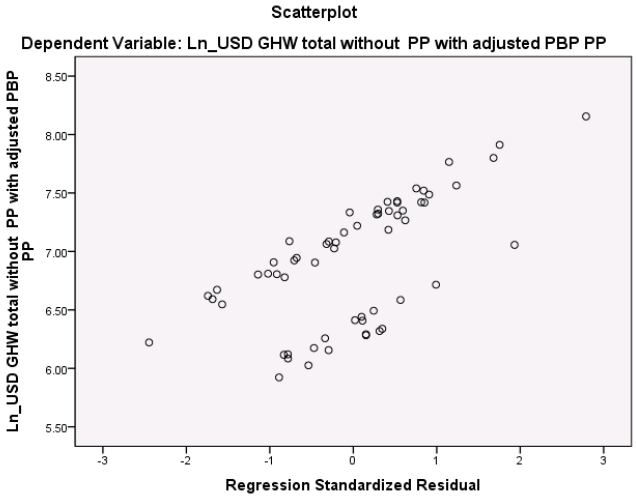
2. Checking the independent variables for their influences to forming the bimodality (plots from regression were shown below)

2.1 Applying all independent variables

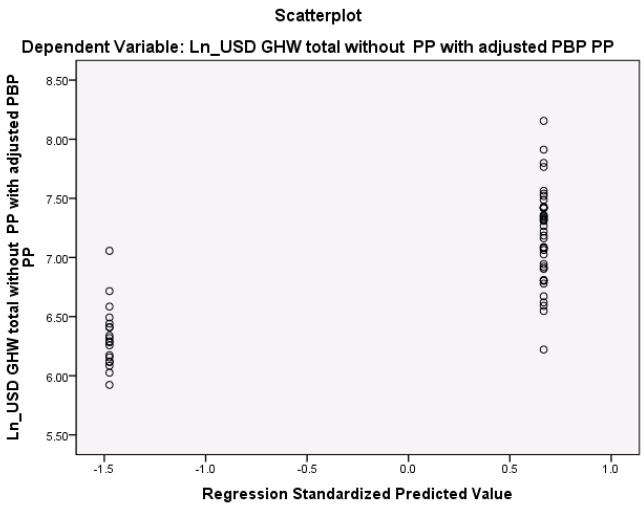
Group A Model 1

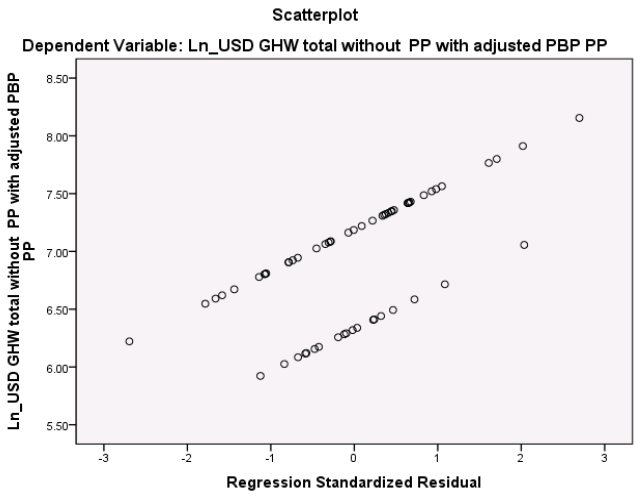
Independent variables: Age + AgeSquared + Married + COD + Economic Status





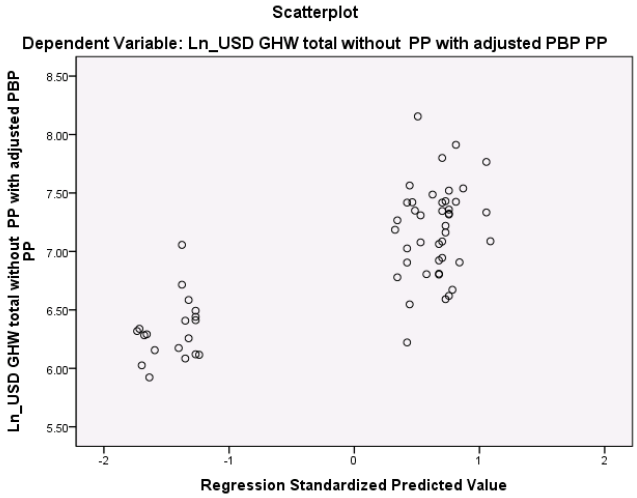
2.2. Applying only COD

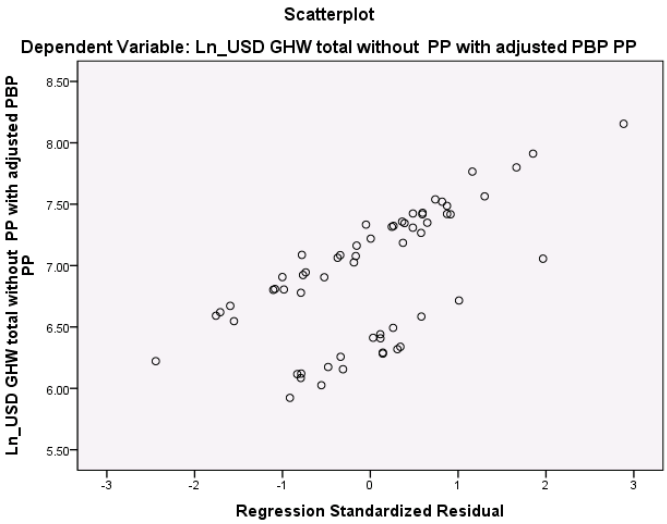




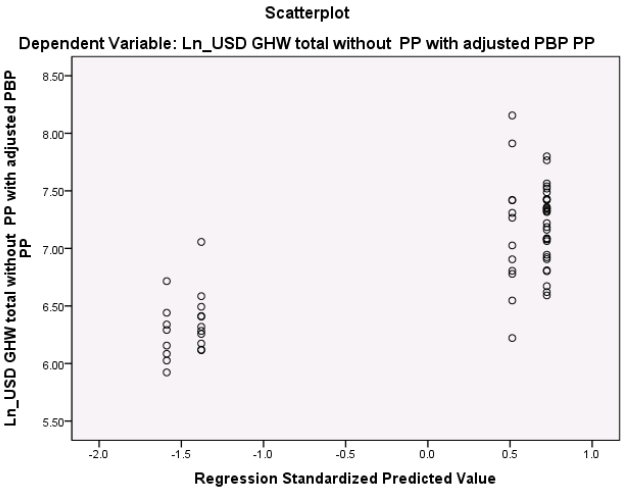
2.3 Regression on pairs which consisted of COD and another independent variable

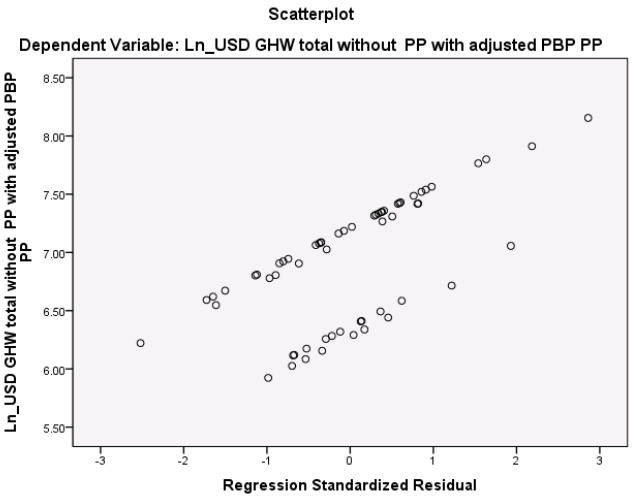
1) COD + Age + Age Squared



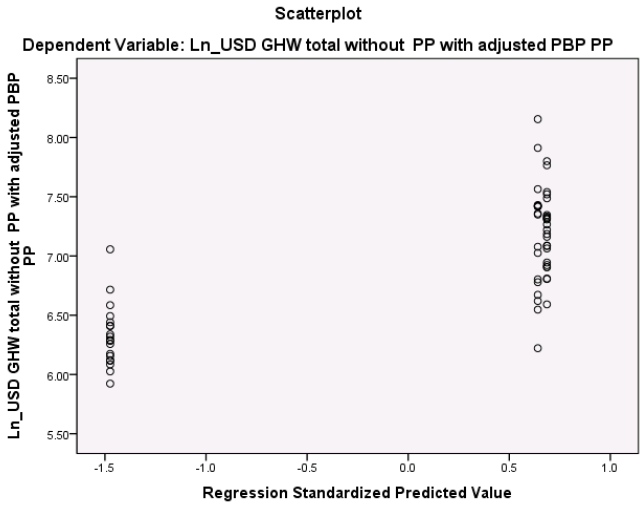


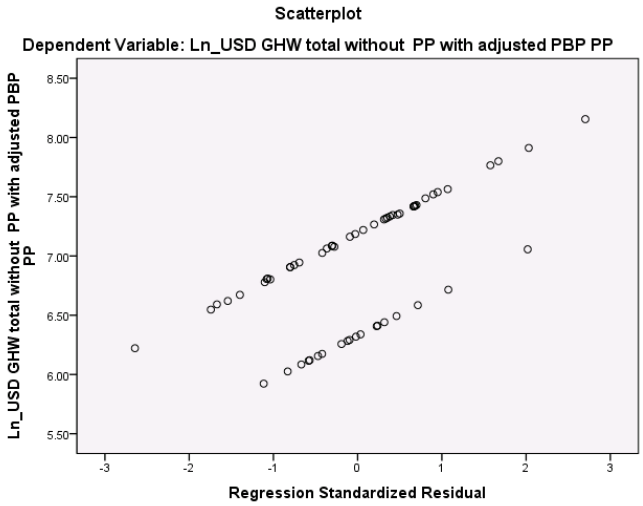
2) COD + Married





3) COD + Economic Status

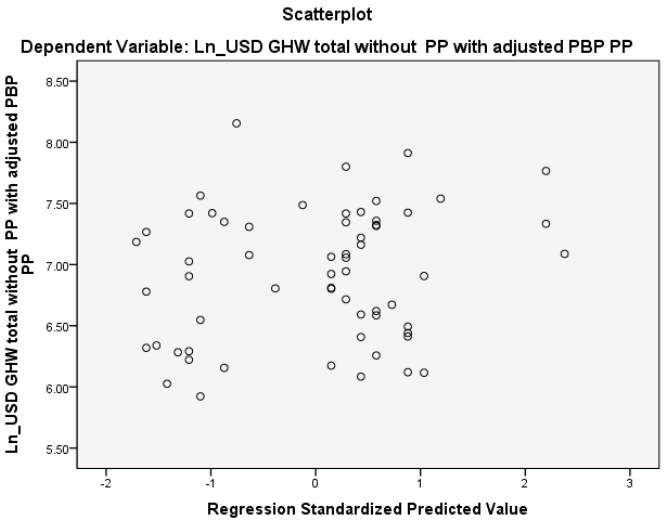


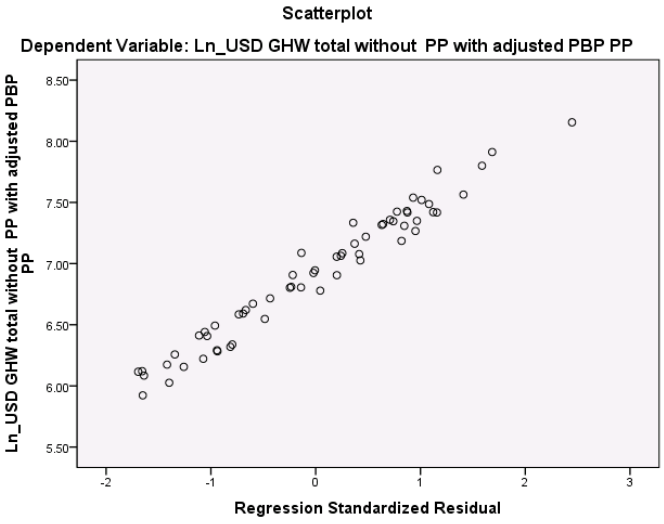


From the plots produced above, order influence of approximate independent variables which might have brought about the bimodality in the original plot was estimated. The order was, from the lowest, Age and AgeSquared, Marred, EconoStatus and COD. The influence of EconoStatus and COD appeared to be close. However, EconoStatus appeared to further divide one of the two groups into two. This might be due to the fact that there were two levels of economic status among three CODs as described above.

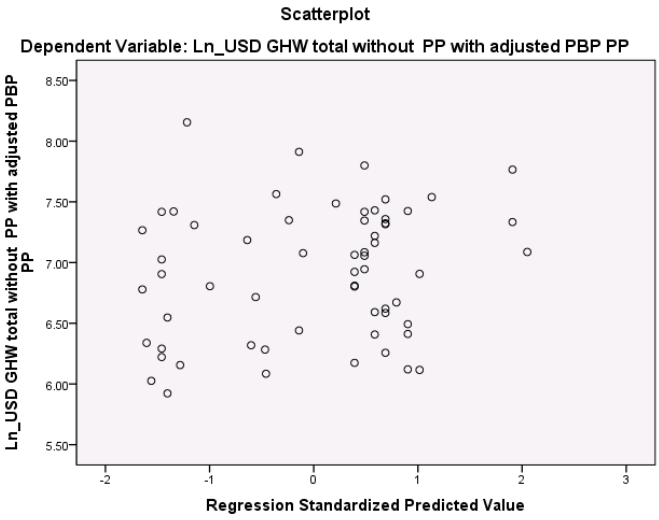
2.4 Adding independent variable one by one according to its approximate influence to the bimodality

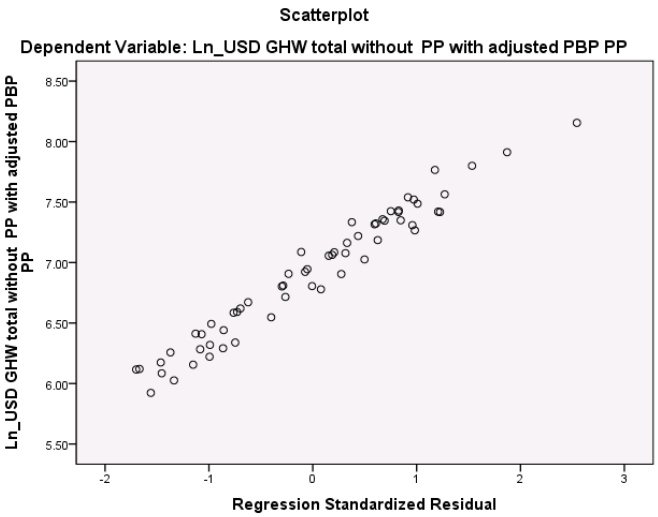
1) Age and AgeSquared



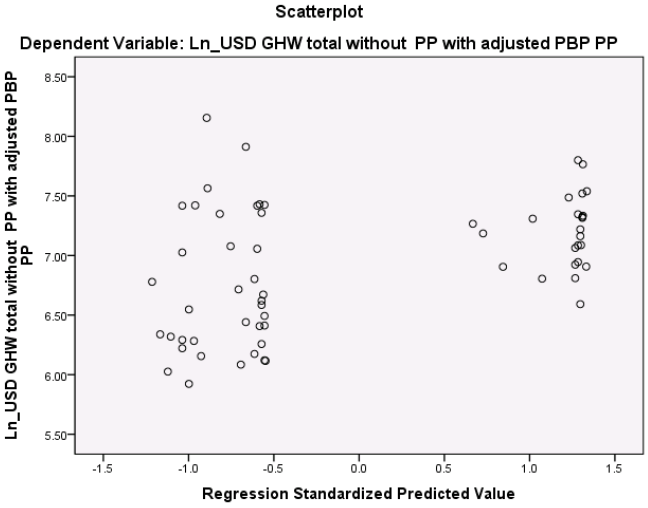


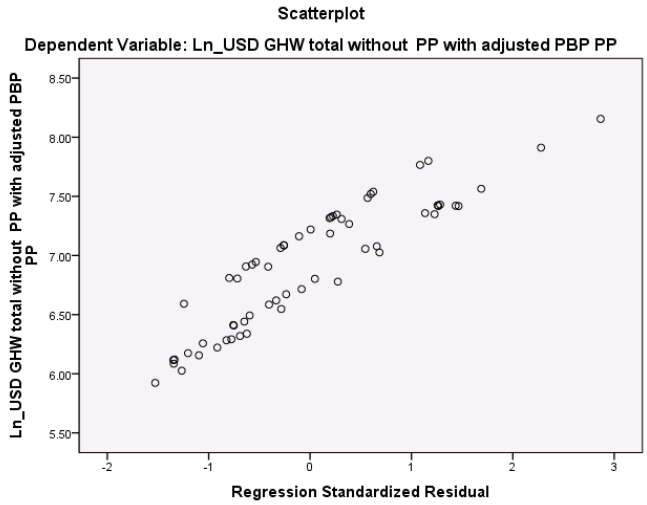
2) Age, Age Squared and Married



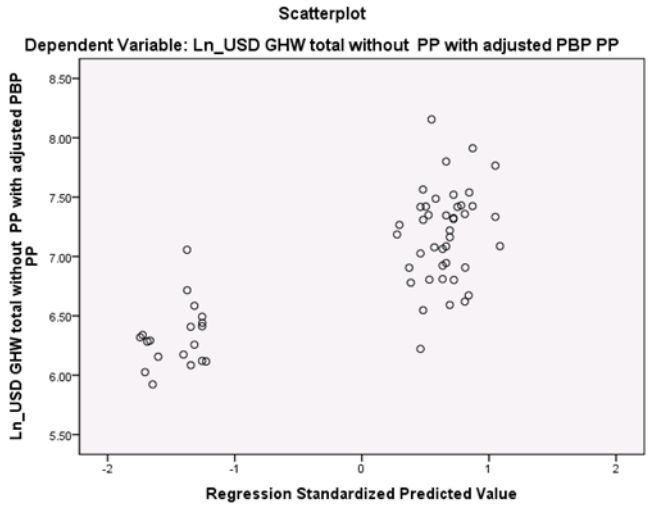


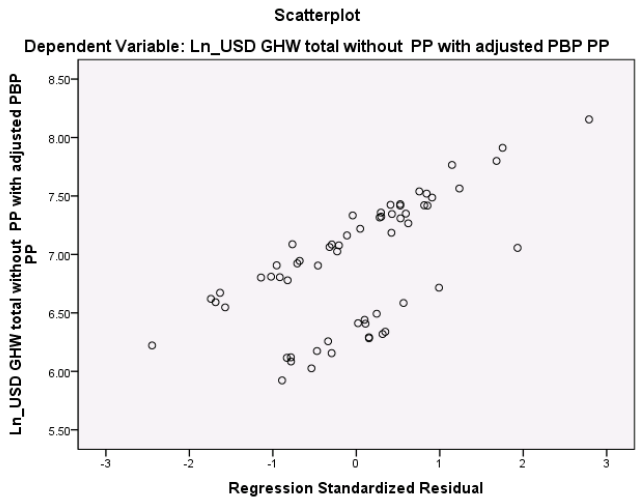
3) Age, Age Squared, Married, Economic Status





4) Age, AgeSquared, Married, Economic Status and COD





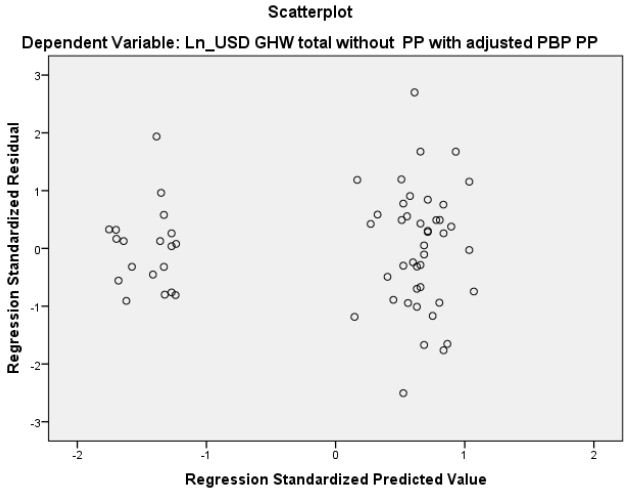
Model 2

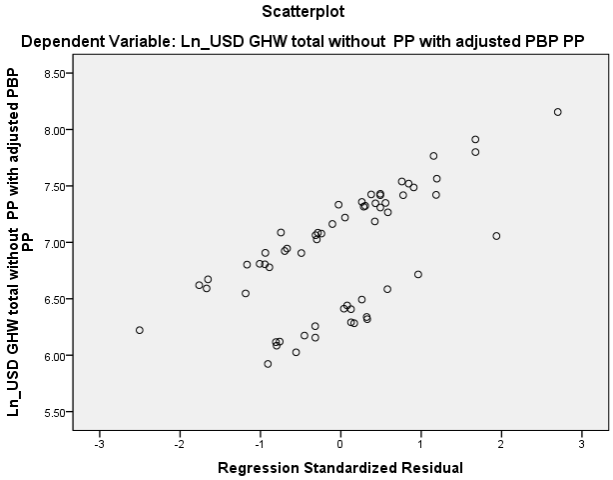
1 Investigation of the dependent variable

Results were the same as result for Model 1.

2.1 Applying all independent variables

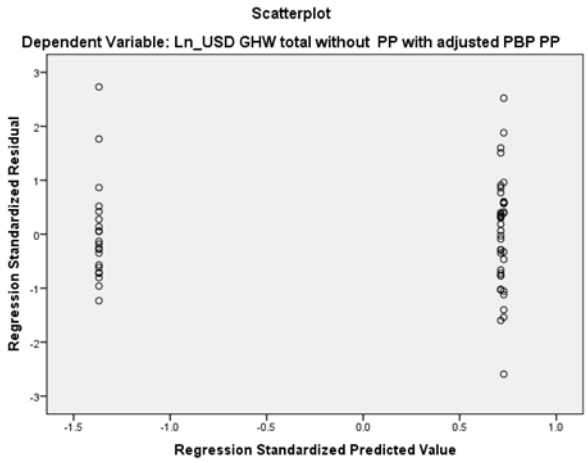
Age + AgeSquared + Married + Prohibition dual practice Mid + Prohibition dual practice Low＋COD

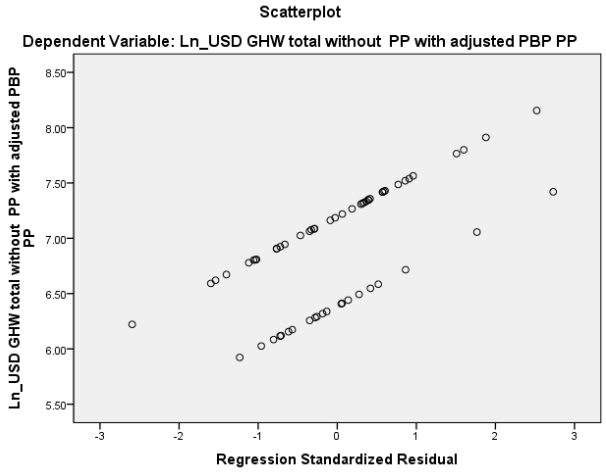




2.2. Applying only Prohibition dual practice Mid + Prohibition dual practice Low

In order to explore the influence of Prohibition dual practice Mid and Prohibition dual practice Low, plots from the regression which had only the two dummy variables for prohibition rules were produced below.

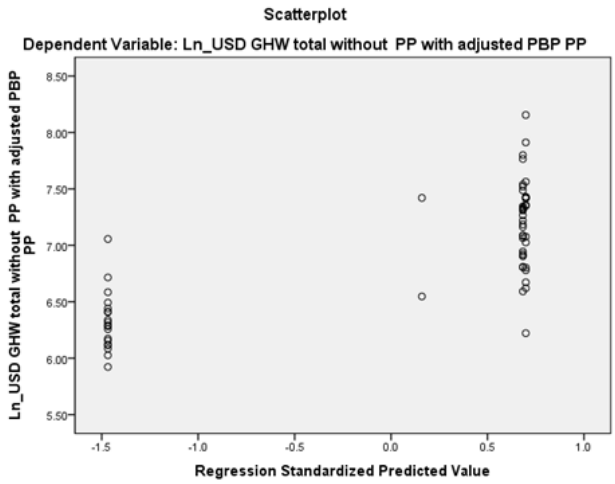


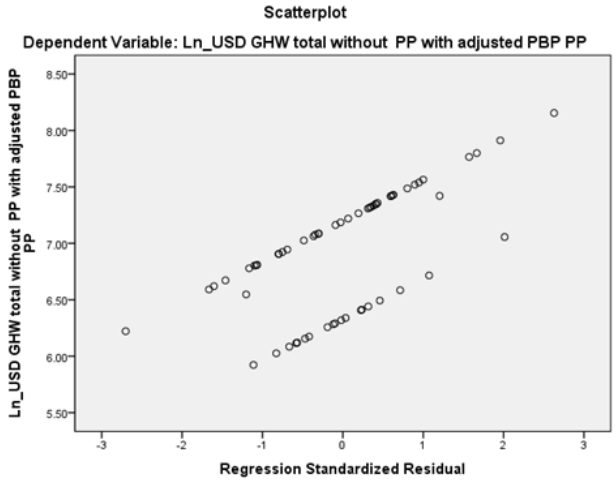


2.3 Applying pairs consisting of COD and another independent variable

1) COD and Prohibition dual practice Mid, and Prohibition dual practice Low

COD was paired with only Prohibition dual practice Mid, and Prohibition dual practice Low because COD was paired with all of other independent variables (Age, AgeSquared, Married, Economic Status) applied to this Model, Model 2 when Model 1 was investigated in above.





2.4 Adding independent variables one by one according to their strength of influence to the bimodality

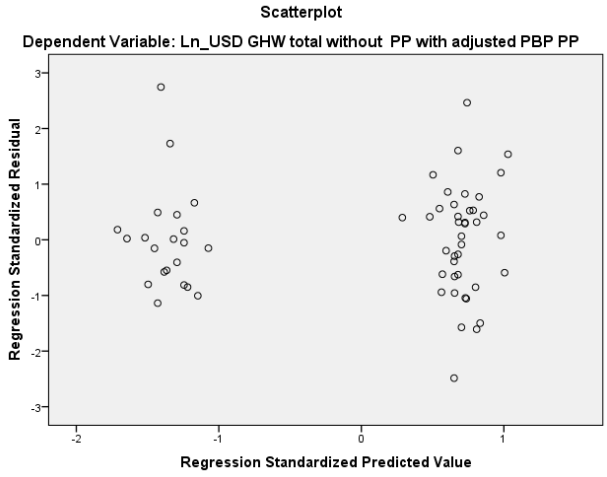
Investigation of Model 2 in this section was began by adding Prohibition dual practice Mid and Prohibition dual practice Low to the regression with Age, AgeSquared, and Married. The regression with these three independent variables was performed in the investigation process of Model 1 above. The plots did not show bimodality.

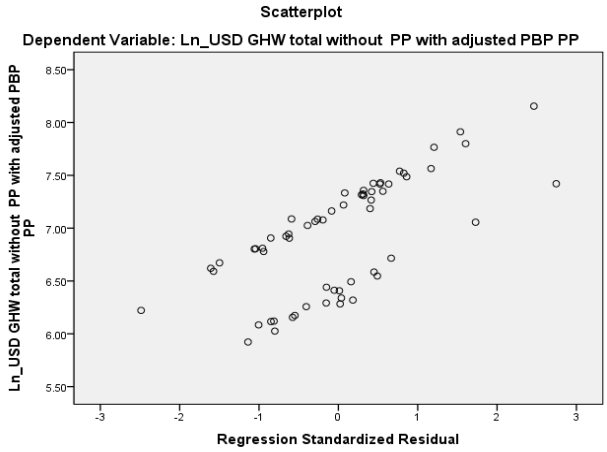
Adding Prohibition dual practice Mid and Prohibition dual practice Low produced plots presented bimodality. The plots appeared to be rather similar to the plots from the regression which had all of the independent variables. Careful comparisons of the plots from two types of regressions identified slight difference.

Similarly might have been brought about in part by factors concerning the following. These variables for the prohibition rules might also have contributed independently to dividing the

plot points into two in a similar way to the way COD influenced the original bimodality. The prohibition rules had three levels of strength (low, middle, strict), but were also able to be divided into two groups (non-enforced =low level, enforced = middle and strict models). The non-enforced group consisted of two MODs and Prea Sdach Operational District and the enforced group two CODs. Therefore, this underlying dichotomus division could be associated with the contracting project since it brought about the two different groups for the strength of dual practice prohibition rules. These test results and the inference suggested that COD made the largest influence to the original bimodality.

1) Age + AgeSquared + Married + Prohibition dual practice Mid + Prohibition dual practice Low

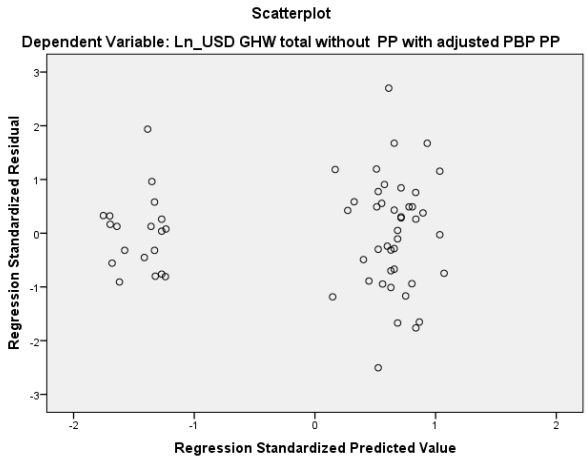


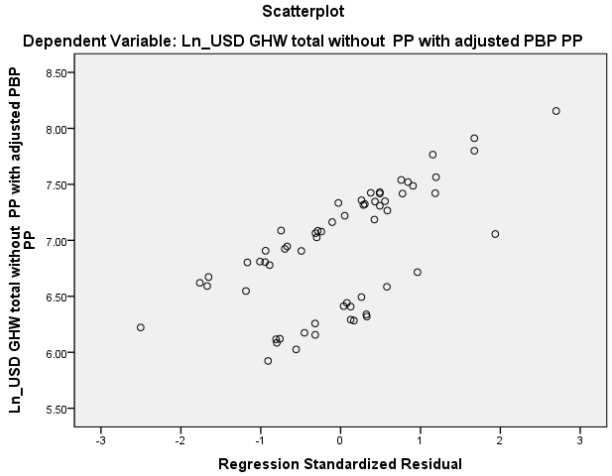


2) Age + AgeSquared + Married + Prohibition dual practice Mid + Prohibition dual practice Low + COD

The addition of COD to the regression above still appeared to maintain bimodality, increasing the number of the group of plot points on the right side of the plot, compared

with the plots from the previous regression which did not have the variable for CODs. Also, the same group appeared to have a larger number of plot points randomly distributed, marginal heteroscadesticity, compared with the previous plot.





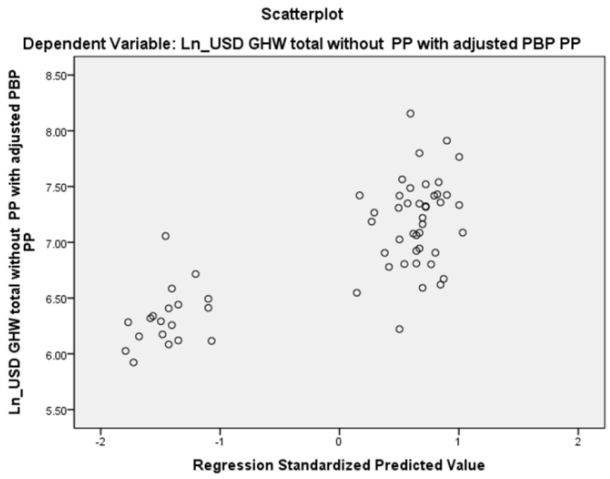
Model 3

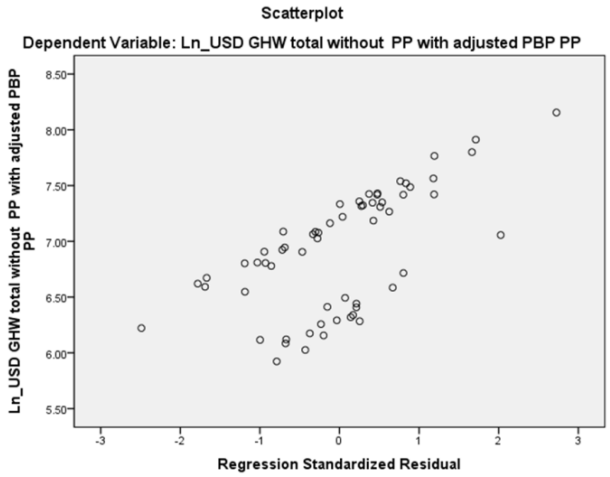
1 Investigation of the dependent variable

Results were the same as the result for Model 1.

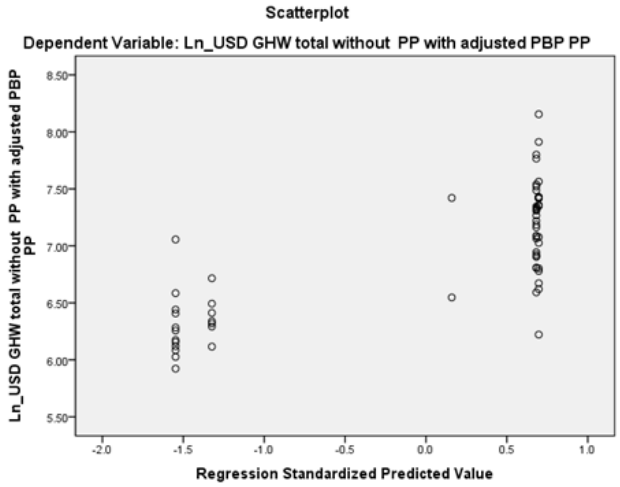
2.1 Applying all independent variables

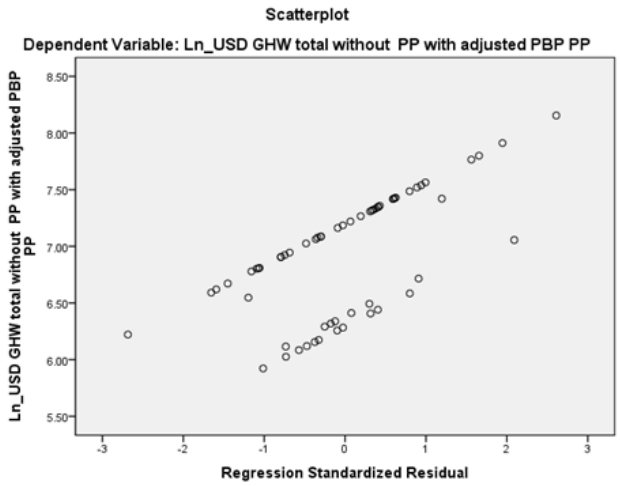
The individual Operational Districts (3 CODs :Peareang, Prea Sdach, Kiriviong and 1 MOD Mesang), Age, AgeSquared, Married





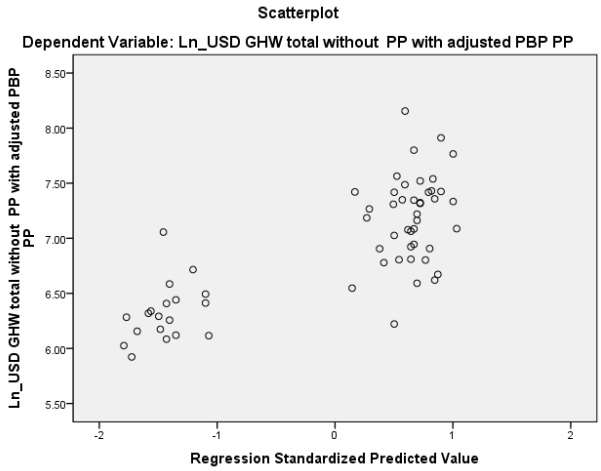
2.2 Only the individual Operational Districts: Peareang, Prea Sdach, Kiriviong (3 CODs) and Mesang (MOD)

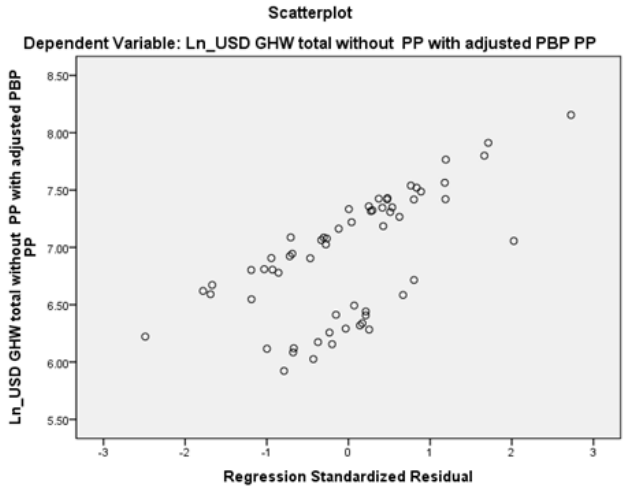




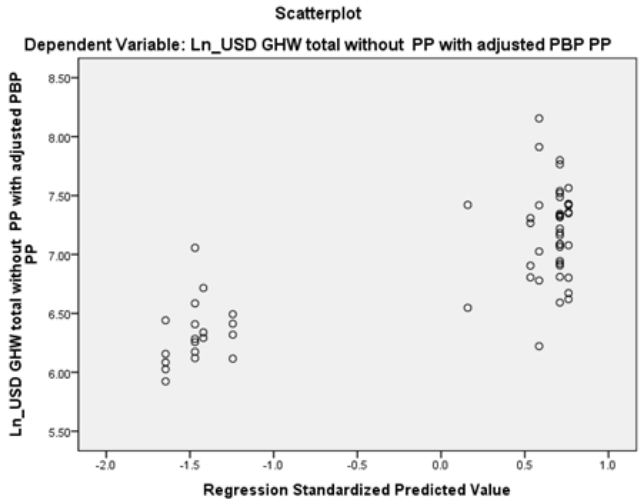
2.3 Regression on pairs which consisted of the individual Operational Districts

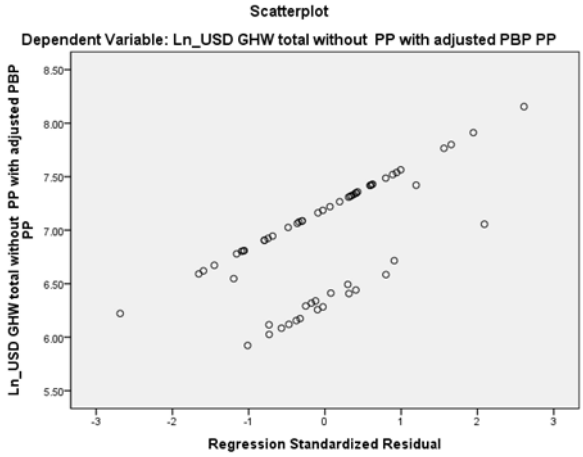
1) The individual Operational Districts, Age and AgeSquared





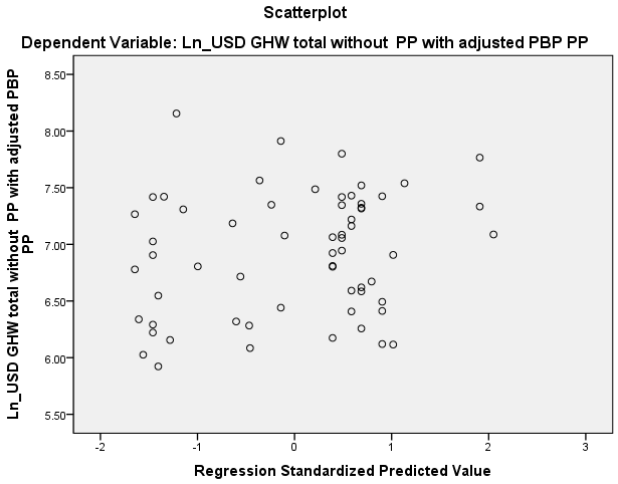
2) Individual Operational Districts and Married

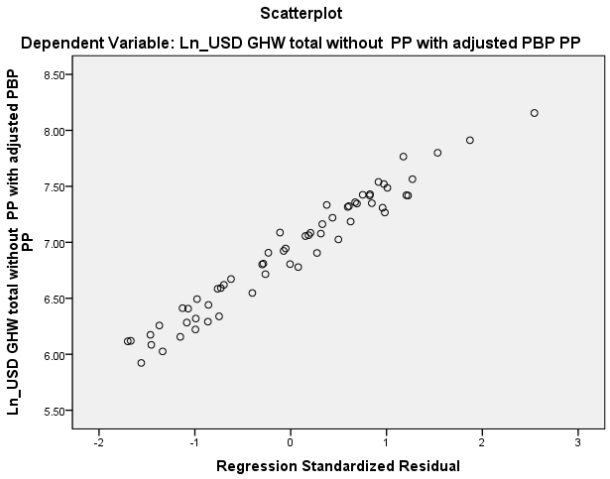




2.4 Adding independent variables one by one according to their strength of influence to the bimodality

This section began from adding the individual operational districts, i.e., Mesang, Peareang, Preah Sdach, and Kiriviong to the regression which had Age, AgeSquared, and Married as the independent variables. The regression with three independent variables was produced in the investigation process of Model 1 but presented below. The plots did not show bimodality.





The addition of Mesang, Peareang, Preah Sdach, and Kiriviong appeared to present the bimodality. Consequently, it might be possible to conclude that COD made the largest influence to the original bimodality.

Appendix 9: Questionnaire for asking allocation of payments associated with the contracting at subcontractor level

Questionnaire on Sub-contracting of Contracting Project

Date:_____ Name (Sub-contractor) : _____

Name of HC Chief (If HC Chief is not the Sub-contractor, indicate it after the name by a click) :_____, _____

Position in the HC (HC Chief, MCH Chief, etc) :_____

Status as a Government Official (please circle): Official Not yet official Hired by Subcontractor

Province (Code) :_____ OD (Code):_____

Health Center Name (Code) :_____

This survey is an academic survey independent from any organisations in Cambodia. This study would like to ask you about things relating to payments to health staff in subcontracting.

1. Indicators

1.1 What kind of activities of your HC are the indicators you, the sub-contractor, need to achieve? Please select from the following (multiple answers are possible).

1.2 What was the value of the indicators for the second quarter of 2007?

Table 1: Answer to Question 1

	Click(√)	Coverage rates	Number
a. OPD			
b. Short-term admission			
c. Specific immunization (specify:_____)			
d. Full immunization (specify excluded one, if any:_____)			
e. TT2 (specify the client:_____)			
f. ANC (specify the definition : e.g. 2 times of visit per/woman, provision of TT2, provision of _____)			
g. Delivery at HC			
h. Delivery at home but attended by HC staff			
i. Birth spacing (specify the methods and unit :_____)			
j. TB (specify:_____)			
k. Referring to Referral Hospital			
l. Other qualitative indicators (specify:_____)			
m. Qualitative indicator (specify:_____)			
n. Others (specify:_____			

1.3 What percentage was the average achievement of these indicators in the second quarter of 2007?

Answer:_____

2. Assigning indicators

2.1 Did you assign a specific staff to achieve a specific indicator of the subcontracting?

Yes No

2.1 Did you assign more than one staff to achieve an indicator?

Yes (specify the indicators by cadre:
_____, _____
_____, _____)
No

3. The Performance-Based Payments (PBP) are paid according to the result of activities of the month. After the contractor-NGO has reviewed the achievement of your health facility and decided the subsidy to your health facilities, you allocate the PBP among the health staff.

Which factors do you use in deciding the contribution made by each health staff in your Health Center to the achievement? (Please click the column after the factors in Table 3. Multiple answers are possible

4. What is the relative importance of each of the factors to the total of them? (If the total of factors is 100%, what percentage do you put on each of the factors?, Please write the percentage in the column in the Table 2. If the importance differs among the staff, please write the average)

Table 2: Answer to Question 3 and 4

Answers	Click (√)	Percentage (%)	
			Average
a. Achievement of the indicator assigned to the staff (%)			
b. The number of patients each of the health staff took to HC			
c. Attributes of the staff (e.g., cadre, responsibilities such as HC Chief, length of employment)			
d. Performances which are expected based on the attributes (e.g. giving correct treatments as health staff responsible for MCH, providing appropriate injections of immunization to a baby as scheduled.)			
e. Behaviours which might have been contribute to the achievement (keep punctuality, abiding the roster, following rules such as about private practice)			
f. Factors or ways of deciding were defined by the Contractor NGO (specify the content) _____ _____			
g. Others (specify)			

5. Do you apply all the factors to all the cadres of your HC at the same percentage as you answered above?

Yes (go to Q7) No (go to Q6)

6. Factor subject for different determinants

6.1 If the answer to Question 5 is "No", to whom you apply the factors? Please indicate in Table 3 the person's cadre and other attributes you consider when you use the factors. Please use the code below when you reply.

6.2 what percentage did you put on each of them (total 100%)? Please indicate in Table 3.

Cadre

Doctor...101 Assistant Doctor...102 Secondary Midwife...103
Primary Midwife...104 Secondary Nurse...105 Primary Nurse...106
Others...107

Responsibility

Chief of HC....201 Deputy Chief of HC...202 Chief of EPI...203 Staff of EPI...204 Chief of MCH...205 Staff of MOH...206 Chief of Internal Medicine...207 Staff of Internal Medicine...204 Chief of Medical (Medicine) Supply ...203 Staff of Medical (Medicine) Supply...204 General Staff (no specific area 205 Others 205

Position in the subcontracting

Manager (subcontractor) ...301 Deputy Manager (Deputy subcontractor)...302 Normal staff in the subcontracting...303

Others (e.g. the status as a government official, Specify)...401

Table 3: Answer to 6.1 and 6.2

	Click(√)	Q.6.1 person's attributes	Q 6.2 %
a. Achievement of the indicator assigned to the health staff (%)			
b. The number of patients each of the health staff took to HC			
c. Attributes of the HEALTH STAFF			
d. Performances which are expected based on the attributes			
e. Behaviors which might have been contribute to the achievement			
f. Others			

7 The following questions ask about details of the factors answered in Question 4.

7.1 If you selected 'Answer c' (Attributes of the staff) (If you did not select Answer C, please go to Question 7.3),

what aspects of the attributes do you consider in deciding the contribution of the health staff to a monthly achievement? Please fill the table 4. If the aspects you consider differs according to the status (a government official or casual staff, or hired by the subcontractor), please describe the differences.

7.2 What is the relative importance of each of the aspects to the total attributes of the health staff to be considered? If the total importance is 100%, what percentage do you put on each of the aspect?

Table 4: Answers to 7.1 and 7.2

Answers	Considered (√)	Percentage (%)	Differences by the status
a. Cadre			
b. Responsibility			
c. Length of employment			
d. Position			
e. Others			

7.3 If you selected ‘Answer d’ (Performances which are expected based on the attributes), what aspects of the performance do you consider in deciding the contribution of the staff?

Table5: Answer to 7.3

Performance	Differences by the status
a.	
b.	
c	

7.4 If you selected ‘Answer e’ (Behaviors which might have contributed to the achievement), what aspects of the behaviors do you consider in deciding the contribution of the staff? If there are differences in the percentage by cadre, or by responsibility, or by position, or by other attributes, please describe them.

Table 6: Answer to 7.4

Answers	Considered (√)	Percentage (100%)	differences by the status
a. Keeping punctuality			
b. Abiding the roster			
c. Abiding the prohibition of private practice			
d. Abiding other rules			
e. Others			

8. A basic or guideline PBB to each of the health staff of you HC was said to be decided. For example, providing every month at least Health staff A (an Assistant Doctor) with US$100.00 and Health staff B (a Secondary Midwife) with US$90.00.

8.1 When you had decided these amounts, which factors did you reflect in the decision? Please click factors in Table 7. Multiple answers are possible. Please click the column in Table 7). If there are other factors within each category of the factors (c to e) that influenced the decision, please specify.

8.2 What is the relative importance of each of the factors to the total, if the total of factors is 100%? Please fill Table 7.

8.3 If there are differences in the application of factors by cadre, or by responsibility, or position, or by others, please specify in Table 7.

Table 7: Answers to 8.1 and 8.2

Factors	8.1. Click (√)	8.1 Specific factors	8.2 Percentage (%)	8.3 Differences (by cadre, responsibility, position, others)
a. Achievement of the indicator assigned to the staff		N/A		
b. The number of patients each of the health staff took to HC		N/A		
c. Attributes of the health staff (e.g., cadre, responsibilities such as HC Chief, length of employment)				
d. Performances which are expected based on the attributes (e.g. giving correct treatment as defined, preparing necessary equipment)				
e. Behaviours which might have been contribute to the achievement (keep punctuality, abiding the roster, following rules such as about private practice)				
f. Factors or ways of deciding were defined by the Contractor NGO (specify the content) Content:_____ __ _____ __		N/A		
g. Others (specify)				

9 User-fee income

9.1 One percent of the user-fee of government health facilities must be sent to the national

treasury, one percent to the provincial health department, and some portion should be used for the operational cost. Some of remaining proportion of the user-fee income can be used for staff payments. In the subcontracting, do you have a separate scheme for allocating the user-fee income among the staff different from the PBP?

Yes No (end of this questionnaire)

9.2 Which points are the main difference of allocation methods between user-fee income and PBP? (Please click the column after the factors in Table below. Multiple answers are possible)

Table 18: Answer to 8.2

	Click(√)
1) factors used in deciding the allocation	
2) relative importance of the factors	
3) cadre of health workers determines the factors and the relative importance of the factors	

9.3 When you decide the allocation, which factors do you reflect in the decision? (multiple answers are possible. Please click the column in Table 7). If there are other factors within each category of the factors (c to e) that influenced the decision, please specify.

9.4 What is the relative importance of each of the factors to the total, if the total of factors is 100%?

9.5 If there are differences in the application of factors by cadre, or by responsibility, or position, or by others, please mention.

Factor	%	Differences (by cadre, responsibility, position, others)
1)		
2)		
3)		
4)		

Appendix 10: Selection processes of the control Operational Districts (MODs)

The three criteria for the selection were:

Criterion a. socio-economic development levels, which were not obviously different from the CODs.

Criterion b. access to the national roads, which is similar to that in CODs.

Criterion c. the Operational Districts, which have not been "heavily" supported by NGOs or donors.

For the definition of "heavily" please see 4.3.2, 3..

(1) Prey Veng Province

First, screening results by the first two criteria are described, since the results were relatively easy to obtain due to the nature of the criteria. After this, the screening result by the third criterion is described.

The two criteria are:

Criterion a. apparent development level;

Criterion b. access to the national roads.

An Operational District which includes the provincial town in its catchment area was excluded due to its apparent developed level (Criterion a).

Another Operational District was excluded because of its apparently more highly developed level; this was due to its including one of the major ferry ports along the Mekong River in south east Cambodia (Criterion a).

The third was excluded because it has a significant advantage over the Peareang and Preah Sdach Operational Districts. It has a national road penetrating its catchment area, whereas Peareag and Prea Sdach Operational Districts have no access at all to a national road from the Operational District (Criterion b).

The remaining criterion is:

Criteria c. the Operational Districts, which have not been "heavily" supported by donors or NGOs.

In order to exclude Operational Districts which had been "heavily" supported by NGOs and/or donors (Criterion c), the level of support by NGOs and donors in Kamchey Mea and Mesang Operational Districts was investigated. As a result of the investigation, the two Operational Districts were not considered to be "heavily supported. Therefore, these two

Operational Districts were selected as the control Operational Districts (MODs). Table A6.1 shows the support in the two Operational Districts (Kamchey Mea and Mesang Operational Districts).

Table A6.1 Support of donors and/or NGOs in the two Operational Districts

	Kamchey Mea	Meseng
Donor	UNICEF	UNICEF
NGO	Ponleu Ney Kdey (Cambodian NGO)	Child Love Association (Cambodian NGO) Christian Care for Cambodia (non-Cambodian NGO)

The Kamchey Mea and Mesang Operational Districts were being supported by UNICEF and relatively small scale NGOs. Although the information collected is not exhaustive, the level of support from UNICEF and that of the other NGOs were not found to be “heavy." Since the support from UNICEF was almost the same in the two Operational Districts, the description of it is written before that of the NGO activities in each Operational District.

UNICEF

UNICEF’s support in Kamchey Mea and Mesang Operational Districts was part of a program in the area of child survival in different locales in Cambodia. UNICEF stationed no staff at the Operational District offices or at the Health Centres (personal communication, Mr. Rasoka Thor, Child Survival Project Officer, May 10, 2006).

NGO: Ponleu Ney Kdey in Kamchay Mea Operational District

A Cambodian NGO, Ponleu Ney Kdey was mainly conducting training of a limited number of HRHs and facilitating community participation in health promotion activities performed by the Health Centres(personal communication. Dara Sokhoeun, Manager, Poneleu Ney Kdey, May 21, 2007.)

NGOs: Child Love Association; Christian Care for Cambodia in Mesang Operational District

A Cambodian NGO, Child Love Association, which was funded by Save the Children U.K., was conducting a project, which was targeted mainly at HIV/AIDs and nutrition in a part of

Mesang Operational District (personal communication. Wat Somuen, Child Love Association, Director, personal communication, April 9, 2006). Also, Christian Care for Cambodia was providing health services for TB, including treatment and education in a northern part of the Operational District (personal communication John Coats, Christian Care for Cambodia, Project Manager, April 25, 2006).

(2) Takeo Province

The screenings were made on the three non-contracted out Operational Districts, first, by the first two criteria above (Criterion a. development level, Criterion b. access to national roads). These screenings excluded all three Operational Districts.

Two Operational Districts in the northern part of the province were excluded by the first criterion. The northern part of the province, which is adjacent to the capital city, is relatively developed. The northern part is also more developed, compared with Peareng and Preah Sdach Operational District in Prey Veng Province. Another Operational District in Takeo Province, which is not at the northern part; but which includes Takeo's provincial town, was also excluded due to its developed socio-economic situation.

The second criterion, b. access to national roads, gave the following assessment regarding all three non-contracted out Operational Districts: they are adjacent to national roads, similar to the access to Kirivong Operational District. It also reinforced the first criteria's exclusion of the two Operational Districts.

One remaining non-contracted out Operational District was screened according to the third criterion (Criterion c. the Operational Districts, which have not been "heavily" supported by NGOs or donors), and was excluded. This non-contracted out Operational District was found to be supported by a NGO and the level was found to be "heavily" supported (personal communication Chan Rada ,RHAC Project Manager, May 1, 2006).

As a result of these screenings, no Control-Operational Districts were selected from Takeo Province. Another Operational District contracted out to SRC was Ang Roker, which included in a relatively developed administrative district town as an important point for transportation in the area.

Appendix 11: Results of SRC Mid-term Review

This section contrasted selected results of the SRC mid-term review and the ADB's evaluation of "ADB Pilot Project"; the selected aspects were common to the two: health service coverage (quantity and quality); cost efficiency; equity. The purpose of this is to contrast the results of the two projects.

(1) Service coverage

All the targets stipulated in the contract agreement between SRC and the MOH had been achieved by SRC by 2006, prior to the end of the project (Jacobs et al.2010). Thus, it could be argued that SRC's implementation in Kirivong Operational District was successful. However, it is noted that the SRC implementation, which began in May 2004, exceeded the final targets in 2004(Jacobs, B. et al. 2010). This implies that the set targets might have been lower than possible achievement, although the health coverage data before the Contracting Project in Takeo was not available at the time. The SRC Mid-term Review evaluated the quality of care (from technical aspects) as "acceptable" and "above average" among government health services then current in Cambodia (SRC 2006 p.17) .

(2) Equity

The SRC Mid-term Review states that thanks to the equity funds, people of a lower socio-economic stratus in the Kirivong and Ang Roker Operational Districts had benefitted more than those of a higher stratum (SRC 2006). However, it cautions that the availability of equity funds exceeded the appropriate level and included those who actually had the ability to pay the service fees (SRC 2006).

(3) Cost efficiency

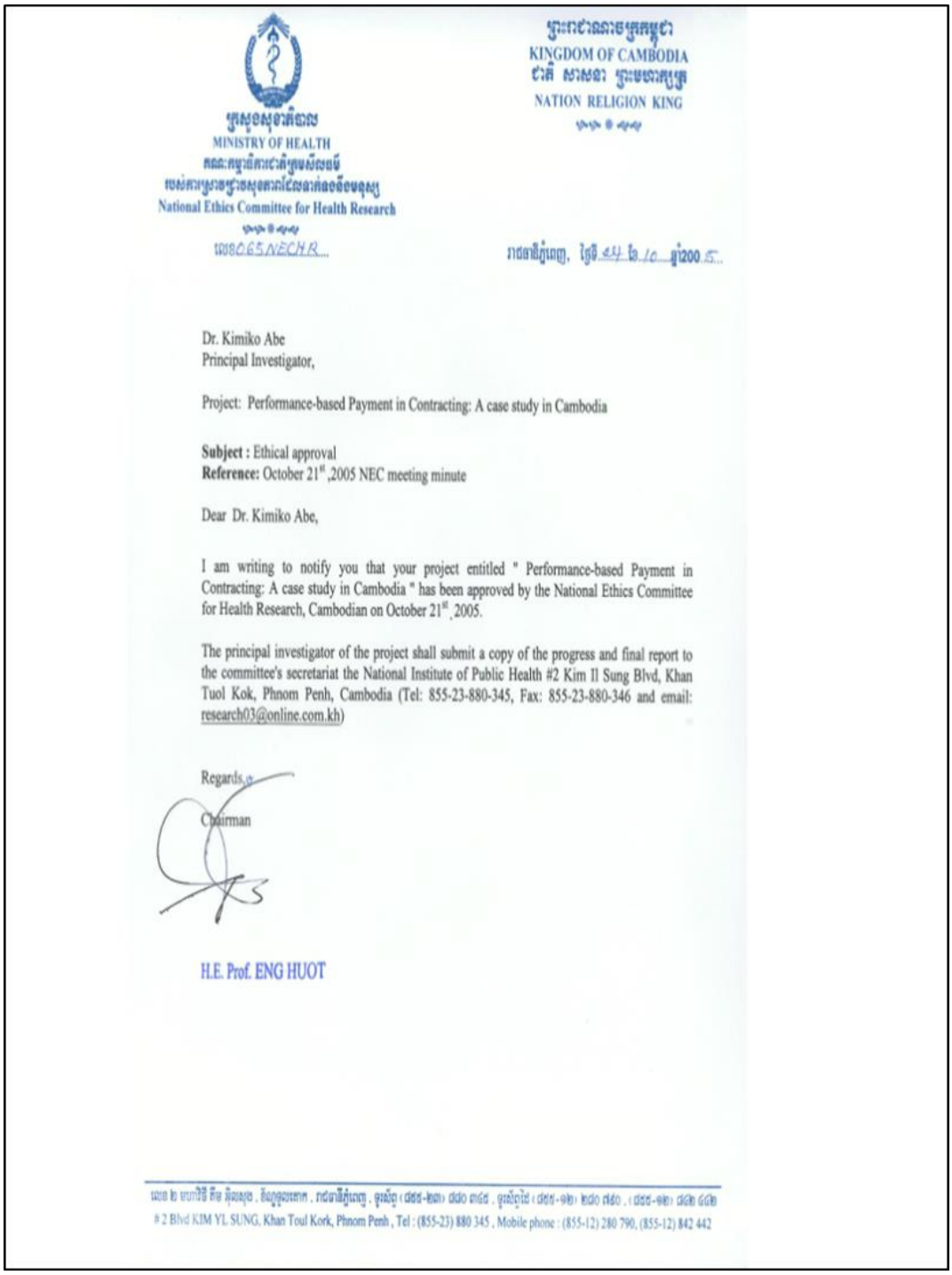
The SRC Report found that the annual per-capita expenditure on health services in Kirivong Operational District was US$3.06(SRC 2006 p.4).

Appendix 12 Number of eligible government health workers and the response rate

Table: Number of eligible government health workers, the number who responded, and the response rate

	Eligible health workers	No. of health workers who responded	Response rate
Operational Districts contracted out (CODs)			
Peareang (Prey Veng Province)	70	65	92.9%
Preah Sdach (Prey Veng Province)	27	25	92.6%
Kirivong (Takeo Province)	68	67	98.6%
Operational Districts managed within MOH system (MODs)			
Mesang (Prey Veng Province)	46	43	93.5%
Kamchey Mear (Prey Veng Province)	64	52	81.3%
	275	252	91.6%

Appendix 13: Ethics approval from Cambodian Ministry of Health Ethical Committee



ព្រះរាជាណាចក្រកម្ពុជា
KINGDOM OF CAMBODIA
ជាតិ សាសនា ព្រះមហាក្សត្រ
NATION RELIGION KING

ក្រសួងសុខាភិបាល
MINISTRY OF HEALTH
គណៈកម្មាធិការជាតិក្រមសីលធម៌
ស្រាវជ្រាវជីវៈវេជ្ជសាស្ត្រលើមនុស្ស
National Ethics Committee for Health Research

ភ្នំពេញ, ថ្ងៃទី ៤៤ ខែ ១០ ឆ្នាំ200 ៥

Dr. Kimiko Abe
Principal Investigator,

Project: Performance-based Payment in Contracting: A case study in Cambodia

Subject : Ethical approval
Reference: October 21st ,2005 NEC meeting minute

Dear Dr. Kimiko Abe,

I am writing to notify you that your project entitled " Performance-based Payment in Contracting: A case study in Cambodia " has been approved by the National Ethics Committee for Health Research, Cambodian on October 21st, 2005.

The principal investigator of the project shall submit a copy of the progress and final report to the committee's secretariat the National Institute of Public Health #2 Kim Il Sung Blvd, Khan Tuol Kok, Phnom Penh, Cambodia (Tel: 855-23-880-345, Fax: 855-23-880-346 and email: research03@online.com.kh)

Regards,

Chairman

H.E. Prof. ENG HUOT

ផ្ទះលេខ ២ ហាវ៉ៃ គីម ឡុងឧបត្ថម្ភ . ទីលូតូឧបាសាក . ភ្នំពេញ . ទូរស័ព្ទ (៨៥៥-២៣) ៨៨០ ៣៤៥ . ទូរស័ព្ទដៃ (៨៥៥-១២) ២៨០ ៧៩០ . (៨៥៥-១២) ៨៤២ ៤៤២
2 Blvd KIM YL SUNG, Khan Toul Kork, Phnom Penh , Tel : (855-23) 880 345 , Mobile phone : (855-12) 280 790, (855-12) 842 442

Appendix 14

Table: Possession rates of durable goods of health workers' households in CODs and MODs, and the national average

	Personal Computer	Air-conditioner	Printer	PC Games
This study	0.8	0.0	0.4	1.6
National average	1.4	0.9	0.4	N/A
	Car	Boat	High-quality wood furniture	Gas cooker
This study	8.4	4.0	48.4	50.8
National average	3.0	9.7	N/A	N/A
	Water sink	Camera		
This study	4.8	4.8		
National average	N/A	N/A		

Source: National data from CSES 2004, modified from Table 1, P.1., Table 2 and 3, P. 2, Table 5, P. 3, MOP 2005 (MOP 2005)

p.420

Appendix Part II

Expenditure Survey of households of Government Health Workers

Control number(GHW Code) : _____ Male interviewer (name, and signature):_____ Interview Dates:_____

Female interviewer (name, and signature):_____ Interview Dates:_____

Supervisor/Editor (name and signature):_____ Date checked by Supervisor/Editor:_____

Date of re-interview if necessary: _____ Re-interviewer:_____

Remarks:_____

Date entry

Operator:_____ Date:_____ Remarks:_____

Government Health Worker (GHW)

Name:_____ Age:_____ Sex (code): _____ HH member ID code: 99

Cadre (code number): _____(Primary Nurse...01, Secondary Nurse...02, Primary Midwife...03, Secondary Midwife...04, Assistant Doctor...05, Doctor...06, others...07, specify)

Health Center(HC)

Province (code):_____(_____) OD (code):_____ Contracted out/MOH (code): _____

HC Name (HC Code) :_____(_____) Commune:_____ Village:_____

Household location :

Commune:_____ Village:_____ House number:_____ Remarks:_____

***GHW Code:_____**

Household head (please fill this section after completion of Section 0A): ***If the GHW and the HH head is the same person, change the ID code to "9901"**

	Name	HH member ID code	Age on the interview date	Sex Male 1, Female 2	Relation to GHW GHW...99, spouse...01, son/daughter-in-law..02, child...03, parent...04, parent-in-law...05 brother/sister 06, brother/sister-in-law...07 grand children...08, grand parent...09, nice/nephew...10, uncle/aunt...11, others...12	Date of interview (DD/MM/YY)	Section responded
HH Head		**01**					

Other respondents (please fill this section after completion of all questions):

Section		Respondent Name	HH member ID Code	HH member Code (GHW Code + HH member ID) use the codes in Section 0A	Relation to GHW (indicate by code of 0A Q6)	Date of interview (DD/MM/ YY)
0	Information	HH head =				
1	Education	The same person who answer Section 7.				
2	Health	The same person who answer Section 7.				
	Last maternal care					
3	Employment	All employed persons				
4A	Housing: Type	HH head =				
4B	Housing: Material	The same person who answer Section 7.				
4C	Housing: Utilities and facilities	The same person who answer Section 7.				
4D	Construction and prices of housing	HH head =				
5	Agriculture, Forestry, Fishery, Livestock and other animal products					
6	Self-Employment (the three most important enterprises)					

7	**Food Expenditure and home production**					
8	**Non-food and durable goods**	**The same person who answer Section 7.**				
9	**Income and remittance**	**HH head=**				
10	**Borrowing, lending, and saving**	**HH head =**				

Section 0 Information of household members *All questions should be asked the household head.

0A Basic information We would like to know the persons who usually live and eat together in this household. Please make a list of your household (HH) members who live here or has been absent for less than 12 months. *Each of the HH members will be provided with a HH member ID code, starting from GHW followed by household head. *If the GHW and the HH head is the same person, the use only the column for GHW. If the number of row is not enough, please add as appropriate.

HH member ID code code	1 Name	2 Age on interview date (less than one years old..99)	3 Sex Male..1, Female 2	4 Birth date (DD/MM/YY) unknown date and month...99/99/yy	5 Birth place Pearenng...1, Kamchay Mea..2, Mesang...3 Preah Sdach...4, Kirivong..5 Phnom Penh...6 Other..7	6 Relation to GHW GHW...99, spouse...01, son/daughter in law..02, child...03, parent...04, parent-in-law...05 brother/sister 06, borther/sister in-law...07 grand children...08, grand parent...09, nice/nephew...10, uncle/aunt...11, others...12	7 HH Member Code (GHW' Code + HH member ID +) written by Surveyor	8 Marital status Married...1 Divorced...2 Separated...3 Widowed (the spouse died) ...4 Never married...5	9 Spouse Is the spouse of [Name] living in this household? Yes...1 No...2
99	**GHW**								
01	**HH Head**								
02									
03									

HH member ID code code	10 food and other daily expenditure, durable goods, education, and health a. Who is the best-informed person on the following topics: food expenditure, non-food daily expenditures such as clothes, consumer durable goods, and expenditures and statuses of education and health of the household members? b. Write the code (HH ID + Relation to GHW).		11 Women who underwent services relating to maternal care a. Do you have female household member who gave a birth in the past 24 months? (Section 2B will use this answer) Yes...1 No...2 b. If the answer to a. is yes, specify name and c. write the code (HH ID + Relation to GHW).		12 Inhabitant How many months in past 12 months did [Name] live in this household? ----months	
99			a. Code (yes or No):		99	
01	a. Name	b. Code (HH ID + Relation to GHW)	b. Name	c. Code (HH ID + Relation to GHW)	01	
02			1		02	
03			2		03	
			3		04	
					05	

0B Occupation

HH member ID code	1 Which work did [Name] conduct for most of the time in the past 12 months? If the person had two such jobs at the different points in the past 12 months, write the two. If the person was a pupil/student, and if the person went more than two school (e.g. moved from a high-school to a university), indicate all schools the person went in the past 12 months. **Employed** Government health worker…1 Private Health worker…2 Other government worker.....3 Private business...4 NGO...5 **Self-employed** Agriculture...6.1, forestry...6.2, fishery...6.3, livestock…6.4, Animal production (egg, duckling)...6.5 Labouror (agriculture, construction, etc. paid daily, monthly salary)...7 Non agriculture health-related (clinic, pharmacy, etc) …8 Non agriculture non health-related...9 Unemployed (including looking for a job)...10 **Schooling (still studying)** Kindergartener…11 **Pupil** Primary School…12 Lower secondary…13 Higher secondary…14 Vocational/Training School pre-secondary certificate/diploma…15 Vocational/Training School post-secondary certificate/diploma…16 **Student** College (2 years)…17 University…18 Post graduate school…19 Others... Specify by A Code (English or PC or other skill training courses without working and going to schools written above...20, others...21)		2 How many months did [Name] engage with the main job in the past 12 months? (months of schooling/studying are asked about, also) ___months	
99				
01				
02				
03				

HH member ID code	3 How many days did [Name] engage with the main job in the past 7 days? ___days		4 What did [Name] engaged in as the secondary work for the other time used for the main work (Q1) in the past 12 months? Use the codes for Q1. None 99.		5 How many months did [Name] engage in the secondary work in the past 12 months? (months of schooling/studying are asked about, also) ___months	6 How many days did [Name] do the secondary work in the past 7 days? ___days
99						
01						
02						
03						

0C Migration (the HH members aged 5 years and over will be asked about)

HH member ID code	7 <The three most important self-employed non-agricultural enterprises of HH and the most informed-person> a. What were the three most important non-agriculture enterprises of the household in the past 12 months? Specify them by Industry Codes on the next page b. who among your household members engaged in each of them in the past 12 months and d. who is the best-informed person about each of them? For b and c, specify the name and HH Member Code* No self-employed persons in this household -->0C			HH member ID code	1 Inhabit out the household (not including commuting) Did [Name] live <u>out</u> the household in past 12 months? <u>Yes…1</u> <u>No…2→end</u>	2 Where did [Name] live? Within Prey Veng Province...1 Within Takoe Province...2 Phnom Penh...3 Other provinces...99	3 How many months did [Name] live out the household? Number of month(if it is Less than 1 month, wirte it as 0.X month)
99	a. Code	b. the HH member (Name and HH Member Code)	c. Best informed person (Name and HH Member Code)				
01				99			
02				01			
03				02			
				03			

Industry Codes

Agro-industry (business)	
Growing rice and other cereals	01
Growing vegetables, horticultural product, nursery products	02
Growing fruit, nuts	03
Manufacturing (food, beverages, tobacco, textiles, apparel, wood products, furniture, rubber, plastic products, machinery, electric apparatus, vehicles, publishing and printing, recycling, etc.)	04
Electricity, gas and water supply	05
Construction	06
Wholesale and **retail trade (operating a shop)**, **repair** of vehicles and household and personal goods, except pharmacy	07
Pharmacy	08
Hotels and restaurants	09
Transport, **post and communications**	10
Financial activities (lending money, etc.)	11
Real estate activities	12
Education (teaching English, computer, and other subjects, developing and selling educational materials, etc.)	13
Health (operating private hospitals, clinic, private practices at home or patients' homes)	14
Social Activities (NGOs, associations)	15
Others	16

1 Education 1A Information Respondent Name: HH Member Code:

HH member ID code	1 Literacy Can [Name] read and write Khmer language? Yes…1 No…2	2 < Completed education> a. To which level of education and b. grade did [Name] completed? If it was a Vocational/Training school, add the code of the education completed before the school. c. when and d. how many years ago did [Name] completed? Multiple answers are acceptable. Kindergarten…1 Primary school…2 Lower secondary…3 Upper secondary…4 Vocational/Training school pre-secondary diploma/certificate…5 Vocational/Training school post-secondary diploma/certificate…6 College (2 years)…7 University…8 Post graduate school…9 Distance education…10 Non-formal education (literacy program, agricultural extension, etc. NOT in-service training)...11, Other...12, No education…13 Foreign language course…14 Computer course…15 Other intensive off-school intensive course (math, classical music, etc.)...16	3 <Current enrollment> a. Which level of education and b. which grade is [Name] attending? Ask about the person who is a pupil /student only. Code numbers are the same as those for Question 2 left.	4 Is the school a public or private school? Ask about members Public school...01, Private school.. 02	5 How many years ago [Name] began to attend? If it was less than one years ago, indicate the months. e.g. 6 months=06, 10 months=10.	6 <current enrollment>place of school a. Did or Does [Name] need to live away the household? b. If the answer to a is yes, specify place, c. years and duration [name] was (is being) away, if it is less than 1 year, write "__months". Yes…1 No…2 Place: Within Prey Veng Province...1 Within Takoe Province...2 Phnom Penh...3 Other provinces...99

		a. School A Code	b. Grade/Year	c. Year completed	d. __years ago	a. School A Code	b. Grade /Year	A Code	__years ago	a. A Code	b. A Code	c.__ years (__months)
99												
01												
02												
03												

Section 1 Education (End) 1B Expenditure (cont'd)

	How much did your household spend for following items for [Name] (write his or her HH member ID code in the first column)? Part 1 Ask about the person who is a pupil/student now Part 2. Ask about those who completed the education in the past 36 months (e.g. if it is June 2007 now, include the time by June 2004) and about expenditures for the final 12 months. Amount of spending (Riels) If the person is attending or attended two levels of education, ask about the two. No spending...0, Unkown...99, If the answer is no spending, write the reason in the columns below the double line.															
HH member ID code	1. Tuition for the all education in the past 12 months (if more than one school/course are attended at the same time, specify the tuition for each school/course)		2 Cost or charges for special activities or events (examinations, festivals, etc.) in the past 12 months		3 Uniform and stationeries in the past 12 months		4 Textbooks, learning materials, private intensive courses for school subjects in the past 12 months		5 Transportation services in past one months, not including motorbikes and bicycles own by the household a. How much is the transportation cost? (if past one month was in a school holiday season, or the month with national holidays, please answer about monthly cost in two months ago). If [Name] did not attend the last month, ask about the cost of final month [Name] attended. b. If [Name] only attended some months, indicate the number of months attended.				6 Snacks or meals, or other foods bought at schools from students' pocket money in past one month a. How much is the cost for them? (if past one month was in a school holiday season, or the month with national holidays, please answer about monthly cost in two months ago) If [Name] did not attend the last month, ask about the cost of final month [Name] attended. b. If [Name] only attended some months, not 12 months, indicate the number of months attended. If attended 12 months, put 12..			
Part 1	1	2	1	2	1	2	1	2	a1 Amt	b1 Mnth	a2 Amt	b2 Mnth	a1 Amt	b1 Mnth	A2 Amt	b2 Mnth

Part 2	1	2	1	2	1	2	1	2	**a1 Amt**	**b1 Mnth**	**a2 Amt**	**b2 Mnth**	**a1 Amt**	**b1 Mnth**	**a2 Amt**	**b2 Mnth**

Section 1 Education (End) 1B Expenditure (cont'd)

HH member ID code	7 Support for the schooling that requires [Name] to live out of the household in the past 12 months, except the tuition		8 Scholarship receiving a. How much has [Name] received scholarship in the past 12 months? b. Specify the school level by code of Q2. C. Specify the term supported. Amount (Riels) Not received...0			9 Total expenditure for education in the past 12 month. Calculated by the survey team
Part 1	**1**	2	**a. Amount**	**b. School Level**	**c.Term supported (years)**	
Part 2	1	2	2	1	2	1

Section 2 Health 2A Last consultation (end) Respondent Name: HH Member Code:

HH member ID code	1 Present health status How do you think [Name]'s current health status is? Good.. 1 Satisfactory..2 Bad...3	2 a. Did [Name] have an illness or an injury in the past 4 weeks? b. if the answer is yes, specify by code. Yes...1, No...2 Road accident...01 Fall from tree or building...02 Snake/animal bite..03, Other accident...04, Diarrhea...05, Fever...06, Respiratory diseases...07, Cough...08, Other illness..09	3 How serious was it? Very … 1 Serious…2 Not serious (not chronic)…3 Chronic…4 Others…5	4 Where did [Name] have consultations for it (the three most-used facilities by codes (Q6))? This house, by the household- member GHW (free of charge)…1 Health Center…2 Referral Hospital…3 Provincial Hospital…4 National Hospital/Cente)…5 Home visit by GHW…6 Private…7 Home visit by GHW (private)…8 Pharmacy…9 Other shop selling drugs...10 Khmer doctor…11 Traditional or religious healer…12 Other…13	5 a. How much was paid for the consultation in total? Amount (Riels) None...0 b. If the money included the drug, indicate drug amount. Amount (Riels) Not included drug charges....99 C. if no money was paid, specify the reason by code (the consultation was free...01, the person who provided services was either a member or a friend of the household...02, somebody outside the household paid the cost...03)	6 <If the cost for drug was included in the payment answered to Q5, skip this and go to Q7> a. How much was paid for the drugs? Amnt (Riels) None...0, b. if no money was paid, specify the reason by code (drugs were not prescribed...01, the prescribed drugs were given free of charge...02, the prescribed drugs were possessed by [Name] or the household...03, Others...04)	7 a. How much was paid for other costs such as transportation, lodging, so forth? Amnt (Riels) None...0 b. if no money was paid, specify the reason by code (other costs were not necessary because the health facility was close...01, somebody outside the household paid the costs...02, Others...03)	8 How much was the total costs of other household members for the [Name]'s consolations (e.g. transportation for accompanying)? Amnt.(Riels) None...0	9. How much was the total cost paid for the illness of [Name] which has been discussed (Q5 to Q8) including other HH members' costs for it? Amnt.(Riels) None...0

	A Code	a. A Code	b. A Code	A Code	a	b	c	a	b.	c	a.	b.	a.	b.	Amnt.	Amnt.
99																
01																
02																
03																

2B Last maternal care (end) If HH members were not found in Section 0AQ10-->Section 3. Respondent Name: HH Member Code:

HH member ID code	1 How many times did [Name] undergo maternal care in past 12 months (only those who were found in the answer to Section 0AQ11) IHH member ID of the person __Times	2 a. What kind of care did you undergo? Antenatal care...1 Delivery…2 Postnatal care…3 Others…4 b. when did you undergo (MM/YY)		3 Where did [Name] have the care including delivery (the three most-used facilities)? This house, by the household- member GHW...1 Health Center...2 Referral Hospital...3 Provincial Hospital...4 National Hospital (National Center)...5 Home visit by GHW...6 Private clinic...7 Home visit by GHW (private)...8 Pharmacy...9 Other shop selling drugs...10 Khmer doctor...11 Traditional or religious healer...12			4 a. How much was paid for the last maternal care in total? Amount (Riels) None...0 b. If the money included the drug, indicate drug amount. Amount (Riels) Not included drug charges....99 C. if no money was paid, specify the reason by code (the consultation was free...01, the person who provided services was either a member or a friend of the household...02, somebody outside the household paid the cost...03)			5 <If the cost for drug was included in the payment answered to Q4, skip this and go to Q6>a. How much was paid for the drug for the last maternal care? Use the codes of Q3 Amount None...0 b. if no money was paid, specify the reason by code (drugs were not prescribed...01, the prescribed drugs were given free of charge...02, the prescribed drugs were possessed by [Name] or the household...03, Others...04)		6 a. How much was paid for other costs such as transportation, lodging, so forth for the last maternal care, Amnt.(Riels) None...0 b. if no money was paid, specify the reason by code (other costs were not necessary because the health facility was close...01, somebody outside the household paid the costs...02, Others...03)		7 How much was the total cost paid of the other household members for the [Name]'s last maternal care(e.g. transportation for accompanying)? Amnt (Riels) None...0	8. How much was the total cost paid for the last maternal care of [Name] which has been discussed by Q1 to Q7, including other HH members' costs for it? Amnt.(Riels) None...0
	___Times	a	b.	a	b.	c	a	b.	c	a.	b.	a.	b.	Amnt.	Amnt.

3. Employment 3A Payment of the main job (end) Respondent Name: HH Member Code:

HH member ID code	1 a. Where did you work this job in the past 12 months? Within this District…1, Within this OD (only GHWs or other health workers can use this code)...2, Phnom Penh…3, Other place…4 b. Who is your employer? Government…01 NGO…02 Private…3		2 In the past 12 month, a. in what frequency did you receive your regular main payment? b. how much was the average amount of your regular main payment? c. How much did you receive the regular payment in total? (If you receive in-kind, please answer the monetary value of the payment). Amount (Riels) Daily...1, Weekly...2 Monthly...3, Other...4			3 In the past 12 month, a. in what frequency did you receive bonuses? b. how much was the average amount of the bonuses? c. How much did you receive the bonuses in total? (If you receive in-kind, please answer the monetary value of the payment). Amount (Riels) None...0 Monthly...1, One time in a year...2, Two times in a year...3, Other...4		
	a.	b.	a. A code	b. Average	c. Total	a. A code	b. Average	c. Total
99								

3. Employment 3A Payment of the main job (cont'd)) Respondent Name: HH Member Code

HH member ID code	4 a. Did you receive each of following payments relating to your work in the past 12 months? b. If so, how much did you receive the payment in total in the past 12 months? Amount (Riels) Yes...1, No...2 Supplemental salaries from donors...01, Performance-based payment...02, Share from user-fee income (the health sector)...03 Per-diem received activities relating to the work (attending training, outreach activities, transport materials, etc.) ...04, Honorarium for giving training or lecture...05 Others (e.g. income from private practice, teaching private educational courses)...06 (Note: if the household head has answered, private practice and teaching private educational courses such as English or PC as ones of "the three most important enterprise of the household" as the answer to Section 0BQ8, do not include payments of these here and include in Section 6)												5 How much did this respondent receive 01 to 06 of Q4 in total in the past 12 months? Amount (Riels) Calculation by Survey Team	6 How much your income did you put in your household budget in the past 12 months? Amount (Riels)
	c. Total	a. A. Code	b. Amt.	c. A. Code	d. Amt.	e. A. Code	f. Amt.	g. A. Code	h. Amt.	I. A. Code	j. Amt.	k. A. Code	l. Amt.	
99		01 ( )		02 ( )		03 ( )		04 ( )		05 ( )		06 ( )		
		01 ( )		02 ( )		03 ( )		04 ( )		05 ( )		06 ( )		
		01 ( )		02 ( )		03 ( )		04 ( )		05 ( )		06 ( )		

3. Employment 3B Payment of the secondary job (cont'd) Respondent Name: HH Member Code:

HH member ID code	1 a. Where did you work this job in the past 12 months? Within this District…1, Within this OD (only GHWs or other health workers can use this code)...2, Phnom Penh…3, Other place…4 b. Who is your employer? Government…01 NGO…02 Private…3		2 In the past 12 month, a. in what frequency did you receive your regular main payment? b. how much was the average amount of your regular main payment? c. How much did you receive the regular payment in total? (If you receive in-kind, please answer the monetary value of the payment). Amount (Riels) Daily...1, Weeky...2 Monthly...3, Other...4			3 In the past 12 month, a. in what frequency did you receive bonuses? b. how much was the average amount of the bonuses? c. How much did you receive the bonuses in total? (If you receive in-kind, please answer the monetary value of the payment). Amount (Riels) None...0 Monthly...1, One time in a year...2, Two times in a year...3, Other...4		
	a.	b.	a. A code	b. Average	c. Total	a. A code	b. Average	c. Total
99								

3. Employment 3B Payment of the secondary job (cont'd) Respondent Name: :

HH member ID code	4 a. Did you receive each of following payments relating to your work in the past 12 months? b. If so, how much did you receive the payment in total in the past 12 months? Amount (Riels) Yes...1, No...2 Supplemental salaries from donors...01, Performance-based payment...02, Share from user-fee income (the health sector)...03 Per-diem for attending training relating to the work ...04, Honorarium for giving training or lecture...05 Others (e.g., private practice, teaching private courses)...06 (Note: if the household head has answered, <u>private practice</u> and <u>teaching private educational courses</u> such as English or PC as ones of "the three most important enterprise of the household" as the answer to Section 0BQ7, <u>do not include payments of these here</u> and include in Section 6)											5 How much did this respondent receive 01 to 06 in total in the past 12 months? Amount (Riels) Calculation by Survey Team	6 How much your income did you put in your household budget in the past 12 months? Amount (Riels)
	a. A. Code	b. Amt.	c. A. Code	d. Amt.	e. A. Code	f. Amt.	g. A. Code	h. Amt.	I. A. Code	j. Amt.	k. A. Code	l. Amt.	
99	01 ( )		02 ( )		03 ( )		04 ( )		05 ( )		06 ( )		
	01 ( )		02 ( )		03 ( )		04 ( )		05 ( )		06 ( )		
	01 ( )		02 ( )		03 ( )		04 ( )		05 ( )		06 ( )		

4 Housing 4A Type (HH head should be the respondent)

1 How many year have your household been living in the current house?

Years

2 Is this house your own house with a legal document?

Yes…1→Q4

Yes, but partly…2→Q3

No….3→Q3

3 To whom this house belongs partially or totally (multiple answers are acceptable)?

Name and relationship with the household head (use HH ID code)

4 Are you sharing this house with another household which has separate budget for living?

Yes…1

No….2

5 How many rooms is your household occupying for what functions, for example, for sleeping and/or multiple purposes)? Please make a list below.

This question does not ask about kitchen, toilet, and those for business use (shops, workshops, etc.)

Function	Code (sleeping...01, living room..02., others...03)	Number
a. Sleeping	01	
b. Room		
c. Room		

6 Are you borrowing this house (not paying money) or renting?

Yes, borrowing...1->4B2

No, renting...2

No...3 →4B2

4B Characteristics Respondent Name.....HH Member Code:

1 How much did your household pay the rent in the past one month? (if not paid, write 0)

Amount (Riels)

2 How big is the plot (land) for the house?

Square meter

3 How big is the house itself?

Square meter

4 What is the main material for the frame of your house? (through Surveyor's observation)

Concrete...1

High quality wood...2

Low quality wood...3

Other...4

5 What is the main material for the roof?

Concrete...1

Tin...2

Fiber Cement...3

Slate-4

Tiles...5

Thatch leaf...6

Others...7

6 What kind of material did you use for the wall?

Concrete ...1

Bricks...2

Wood or log...3

Plywood...4

Zinc sheet...5

Thatch leaf...6

Other...7

7 What is the main material for flooring? (through observation)

Tiles...1

Cement ...2

Parquet Wood...3

Wood board...4

Bamboo, palm ...5

Other...6

4C Utilities and facilities **Respondent Name.....HH Member Code:**

1 What kind of a system of electricity is your household mainly using?

Supplied by suppliers (government/private)...1

Generator...2

Battery...3

Others...4

2 How much did your household pay for the electricity or the system of electricity in the last one month (Riels)?

Not pay...0

3 How much did you pay for the garbage collection in the last on month (e.g. written in the same invoice for electricity) (Riels)?

Not pay...0 ☐

4 What kind of water facility or water is the most important for your household for drinking in dry season and rainy season?

Piped water…1

Public tub…2

Tube/piped well or borehole…3

Protected dug well…4

Unprotected dug well...5

Rain Water…6

Water from river or pond, or stream…7

Sold water (tank truck vendor)…8

Others...9

1 Dry Season	
2 Rainy Season	

5 How much did your household pay for the water in the last one month (Riels)?

Not pay...0 ☐

6 Which type of toilet do you have in your house?

Toilet connected to sewerage...1

Septic tank...2

Pit latrine...3

Open land...4

None...5

Others...6 ☐

7 What kind of fuel did your household used mainly for cooking in the past 12 months?

Gas…1

Charcoal…2

Wood…3

Others (e.g. chafe) ☐

8 Does anyone in your household own a mobile telephone?

a. Yes...1-->b. No….2→18

b. Specify all the person by HH member ID. ☐

9 a. How much did your household pay for the total charge of mobile telephones in the last one month? b. If individual household members are paying from their pocket money, please specify who are paying by HH member ID. c. How much did the members pay in the last one month?

a. Total charge (Riels) ☐

	b. HH member ID	c. Charge paid (Riels)
1		1
2		2
3		3

4D Construction and prices of housing

Respondent Name.....HH Member Code:

1 When was the main part of this house constructed?

2 If you added any part after the main construction, when was it?

3 a. How much did your household pay for constructing this house (the main and added part) in total? Amount (Riels)

Not pay...0

b. If no money was paid specify reason by code (inheritance.. 001, others..002)

4 a. How much did your household pay for purchasing the plot of this house (the main and added part ? Amount (Riels)

Not pay...0

b. If no money was paid specify reason by code

(inheritance.. 001,

given by the government due to being government workers...002 occupying the state land and having a right to use...003,

borrowing seasonal/annual...004, others...005)

5 (Hypothetical questions only to house owners) If your household did not own this house (including land), how much monthly rent would your household need to pay to live a house like this in this village (Riels)?

6 How much would your household pay for buying your house building today (Riels)?

7 How much will your household sell this land (Riels)?

Unknown...99

1 What was the main purpose of the agricultural activities of your household in the past 12 months? **Household consumption only...1-->end 5A Mainly house consumption plus sales of the surplus....2, Mainly sales plus home consumption...3, Sales only...4 Others...5**	**2 a. How large is each of the plots? b. What it the unit?** **Square meter (m2)...1 Are...2** **Hectares...3 Rai...4 Kong...5 Other...6**		**3 (Rainy season) a. What product did you household grow in the plot in the last rainy season? (Product Codes, see next page)** **b. How much amount (quantity, Kg) did you harvest from the cropping?** **c. How much gross income (Reals) for d. what amount (quantity) did your household obtain from the last rainy season?** **If the quantity is unknown, write the code 99, for the price 999**			
	a.	**b.**	**a. Product A code**	**b. Quantity (Kg)**	**c. Gross Income Amnt.**	**d. Quantity (Kg)**
	1		**1st harvest**			
			2st harvest			
	2		**1nd Harvest**			

			2st harvest			

Section 5 Agriculture (fishery, forestry) and Livestock

	4 a. For which input of the following, did you spend for regarding each of the products answered to Q2 in the last rainy season? b. How much? c. For what quantity did you spend? Write it with the unit. **Amnt. (Riels)** **None..0, Seeds and seedlings…01 Fertilizer and insecticide…02 Labor…03 (Quantity=Write number of laborers hired in total and the total cost for the number) Storage…04 Transportation…05 Pumping for irrigation…06 Any items above given for free …07, specify the item code after the "07" as 07__. Improvement land and buildings…08 Any items above obtained by credit …09, specify the item number after the "09", Others…10**			**5 How much net income (Reals) from the each of the products answered to Q3 did your household obtain in the past 12 month? (Calculated by Survey Team)**	**6 How much did you put from the income, including the one answered to Q5, from last dry season in the budget for your household in the past 12 months?** **(Rainy season cropping end)** **Amnt.(Riels)**
	a. A code	**b. Amnt.**	**c. Quantity (Kg. or the total number of person hired)**	**Amnt.**	**Amnt.**
1st harvest					
2st harvest					
1nd Harvest					
2st harvest					

Product Code

	For first harvest	For second harvest
Rice	1	6
Sticky Rice	2	7
Vegetable	3	8
Fruits	4	9
Others	5	10
If the household made more than third harvest, use the code 1 to 5 again.		

5A Agriculture (end)

Plot code	7 (Dry season) a. What product did you household grow in the plot in the last dry season? If answer is none, end 5A. (Product Codes, see the previous page) b. How much amount (quantity, Kg) did you harvest from the cropping? c. How much gross income (Reals) d. for what amount (quantity) did your household obtain from the last dry season? If you sold one product several times, specify the farm-gate price of each of sales in the last dry season. If the quantity is unknown, write the code 99, for the price 999				8 a. For which input of the following, did you spend for regarding each of the products answered to Q7 in the last rainy season? b. How much? c. For what quantity did you spend? Write it with the unit. Amnt. (Riels) None...0, Seeds and seedlings…01 Fertilizer and insecticide…02 Labor…03 (Quantity=Write number of laborers hired in total and the total cost for the number) Storage…04 Transportation…05 Pumping for irrigation…06 Any items above given for free …07, specify the item code after the "07" as 07__. Improvement land and buildings…08 Any items above obtained by credit …09, specify the item number after the "09", Others…10			9 How much net income (Reals) from the each of the products answered to Q3 did your household obtain in the past 12 month? (Calculated by Survey Team)	10 How much did you put from the income, including the one answered to Q9, from last dry season in the budget for your household in the past 12 months? (Dry season cropping end) Amnt.(Riels)
	a. Product A code	b. Quantity (Kg)	c. Gross Income Amnt.	d. Quantity (Kg)	a. Q code	b. Amnt.	c. Quantity (Kg. or the total number of person hired)	Amnt.	Amnt.
1	1st harvest								
	2nd Harvest								

2	**1st harvest**								
	2nd Harvest								

5B Forestry and/or fishery

Respondent Name: **HH Member Code:**

1 Please make list of all fishery and/or non-forest products of your household produced in the past 12 months. Codes for forestry Fish caught...1 Fish raised...2 Fish trapped ...3 Others...4 Codes for fishery Mushrooms...5 Nuts...6 Others...7	2 How much gross income did you obtain from selling it? (farm-gate price in Riels) Amnt..(Riels)	3 a. For which input of the following, did you spend for forestry and/or fishery in the past 12 months? b. How much? c. For what quantity did you spend? Write it with the unit. None...0 Codes for forestry Equipment…1 Transportation…2 Labor…03 (Quantity=Write number of laborers hired in total and the total cost for the number) Labor…03 (Quantity=Write number of laborers hired in total and the total cost for the number) Permission fee for harvesting 4 Others…5 Codes for fishery Equipment (fishing gear and others)…6 boat…7 Labor…8 (Quantity=Write number of laborers hired in total and the total cost for the number), Feeding...9, Others…10			4 How much net income did your household obtain from forestry and/or fishery in the past 12 months? Amount (Riels) Forestry...1 Fishery...2 (Calculated by Survey Team)		5 How much net income did you put in your household budget in the past 12 months? Amount (Riels)	
Q code		a. Code	b. Amnt.	c. Quantity	a. Q code	b. Amt.	a. Q code	b. Amt

5B Forestry and/or fishery (end)

1 Please make list of all fishery and/or non-forest products of your household produced in the past 12 months. Codes for forestry Fish caught...1 Fish raised...2 Fish trapped ...3 Others...4 Codes for fishery Mushrooms...5 Nuts...6 Others...7	2 a. How much gross income did your household obtain from sales of the each of the animals in the past 12 months? b. From what number of animals did you obtain? Amnt(Riels)		3 a. For which input of the following, did you spend for your live stock raising in the past 12 months? b. How much? c. For what quantity did you spend? Write it with the unit. d. If your household purchased animals specify the kind by codes for Q1. Amnt(Riels) Purchasing animals...501, Feed...502 Veterinary services...503 Breeding services...504 Repair and maintenance of livestock facility...505 Transportation...506 Electricity...507 Other...508				4 How much net income did your household obtain from livestock raising in the past 12 months? Amnt. (Riels) (Calculated by Survey Team)		5 How much net income did you put in your household budget in the past 12 months? Amnt .(Riels)	
Q code	a. A code	b. Number	a. Amnt.	b. Number	a. A code	b. Amnt.	c. Quantity	d.	Amnt.	Amnt.

5C Livestock and other animal products Respondent : name HH Member Code

1 Please make list of all livestock your household and indicate their present number. Cows...1 Buffalo...2 Horse...3 Pig...4 Poultries...5		**2 a. lHow much gross income did your household obtain from sales of the each of the animals in the past 12 months? b. From what number of animals did you obtain?** **Amnt(Riels)**		**3 a. For which input of the following, did you spend for your live stock raising in the past 12 months? b. How much? c. For what quantity did you spend? Write it with the unit.** **d. If your houshold purchased animals specify the kind by codes for Q1.** **Amnt(Riels)** **Purchasing animals...501, Feed...502** **Veterinary services...503** **Breeding services...504** **Repair and maintenance of livestock facility...505** **Transportation...506** **Electricity...507** **Other...508**				**4 How much net income did your household obtain from livestock raising in the past 12 months?** **Amnt. (Riels)** **(Calculated by Survey Team)**	**5 How much net income did you put in your household budget in the past 12 months?** **Amnt .(Riels)**
a. A code	**b. Number**	**a. Amnt.**	**b. Numer**	**a. A code**	**b. Amnt.**	**c. Quauntity**	**d.**	**Amnt.**	**Amnt.**

5C: Livestock and other animal products (end)

:

6 Please make list of all animal products by your household in the past 12 months and indicate their present number. **Egg...1** **Duckling...2** **Others...3**		**7 How much gross income did your household obtain from sales of the each of the animal products in the past 12 months?** **Amnt(Riels**	**8 a. For which input of the following, did you spend for <u>producing animal products</u> in the past 12 months? b. How much? c. For what quantity did you spend? Write it with the unit. d. If your household purchased animals specify the kind by codes for Q1.** **Amnt(Riels)** **Purchasing animals...501, Feed...502,** **Veterinary services...503** **Breeding services...504** **Repair and maintenance of livestock facility...505, Transportation...506** **Electricity...507, Other...508**				**9 How much net income did your household obtain from animal products in the past 12 months?** **Amnt (Riels)** **(Calculated by Survey Team)**	**10 How much net income did you put in your household budget in the past 12 months?** **Amnt (Riels)**
a. Q code	**b. Number**	**a. Amnt.**	**a. Q code**	**b. Amnt.**	**c. Quantity**	**d**	**Amnt.**	

5D: Machinery and equipments Information and expenditure (end)

Respondent Name (the best-informed person for the agriculture) :

HH Member Code:

		1.a. In the past 12 months, how many of following items did you household owned? b. If so, what was ownership of each of the items Not have...0 Owned...1 Lent...2 Borrowed...3→Q4 Not buy, shared...4→Q4 Others...5		2. a How much did this household pay for the purchasing? If it was borrowed from, or lent to the other household in the past 12 months, b. how much did you pay for the borrowing? c. Or how much did you obtain from the lending? Amnt(Riels)			
		a. number	b. ownership	a. Amnt.	b. Amnt.	c. Amt.	b. Amnt.
Harrow /rake	551						
Plough	552						
Hand tractor	553						
Cart	554						
Motor pump	555						
Others	556						

6 Self-employment, three most important enterprises of the household

Respondent: the best-informed person Name: HH Member Code:

The three most important enterprises Code 0BQ7	1 a. what kind of enterprises were they ? (confirm and write the code from the answer to 0BQ7). b. Who were the main customers? General public...1 Persons who conduct particular works...2 Patients...3 Others...4		2 How much was the gross income of the enterprise in the past 12 month? Amnt. (Riels)	3 a. For which input of the following, did this enterprise pay in the past 12 months? b. how much? (If something was paid in kind, please convert it into monetary value.) Amount (Riels) Not pay...0 electricity...1, water...2, fuels (gasoline, kerosene)...3, Raw material...4, Labor...5, Permission charge for operation...6 Other operational expenditure ...7		4 How much was the net income of the enterprise in the past 12 month? Amnt(Riels) (Calculated by Survey Team)	5 How much of the net income did you put in your household budget in the past 12 months? Amnt (Riels)	6 If you need to sell of this the entire enterprise with the set equipment, how much is the price? (Riels)
	a. A Code	b. A Code	Amnt.	a. A Code	b. Amnt.	Amnt.	Amnt.	Amnt.
1								
2								
3								

7. Food-expenditure and home production(cont'd) (the most knowledgeable person about food-expenditure will be asked

Respondent: Name: HH Member Code:

1 How much does your household usually pay for foods for a typical week? If the food includes the food which was produced by your household, or bartered or given from other households, estimate the market price of the food and include in the total payment.

Riels

2.. In what quantity and how much (Riels) does your household usually pay for following food items for a week? If your household consumed the item which was produced by your household, or bartered or given from other households, estimate the market price of the quantity consumed and include it in the total payment.

	a. Quantity	b. Unit	b. Riels
Rice 7001			
Noodle (Khmer, Chinese)7002			
Bread 7003			
Fruit vegetable 7005			
Flower vegetable 7006			
Tuber vegetable 7007			
Stem vegetable 7008			
Meat 7009			
Fish 7010			
Egg 7011			
Fruit 7012			
Nut 7013			
Other ingredients (salt, sugar, , oil, source, etc.) 7014			
Non-alcoholic beverage (tea, , coffee, juice, etc.) 7015			
Alcoholic drink (rice wine, beer, etc.) 7016			
Tobacco 7017			
Others 7018			

7. Food-expenditure and home production (cont'd)

Code for unit for Q4,5,6.

Kg	1	Piece (e.g. 3 pieces of bread)	2	Bottle, can, package	3
Other	4				

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2 .			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c. How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please Indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Code	A Cod	a.	b.	c.	a.	b.	c.	a.	b.	c	
Rice (normal)	701FB											
Sticky rice	702											
Rice Broken	703FB											
Corn on the cob	704FB											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? **Yes...1** **No...2**			**4 a. What quantity of the food did your household purchase or barter in the past one week?** **b. Please indicate the unit. c How much was it (if it was purchased in retail market)?** **Amnt.(Riel)**			**5 a. What quantity do your household consume the item in a typical week?** **b. Please indicate the unit.** **c. How much do you pay for it?** **Amnt.(Riels)**			**6 a. What quantity did your household consume the home production in a typical week?** **b. Please indicate the unit.** **c. How much was it, if it was purchased in retail market?** **Amnt.(Riel)**			**7 How many months did your household usually purchase the item in <u>the past 12 months?</u>**
	Q Cod	**A Co**	**a.**	**b.**	**c.**	**a.**	**b.**	**c.**	**a.**	**b.**	**c.**	
Rice cakes	**705FB**											
Khmer noodles	**706FB**											
White rice	**707FB**											
Bread	**708FB**											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c. How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please Indicate the unit. c. How much do you pay for it? Amnt.(Riels)				6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)		7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Code	A Cod	a.	b.	c.	a.	b.	c.	a.	b.	c	
Morning glory	709											
Cabbage	710											
Spinach	711											
Other Leaf vegetable	712											
Tomatoes	713											
Eggplants	714											
Cucumber	715FB											
Mung bean	716FB											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Cod	A Code	a.	b.	c.	a.	b.	c.	a.	b.	c.	
Mung bean	717											
Ridge	718											
Green gourd	719											
Other Fruit	720											
Cauliflo	721											
Broccoli	722											
Other	723											
Potatoes	724											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Cod	A Code	a.	b.	c.	a.	b.	c.	a.	b.	c.	
Sweet potatoe	725											
Onions	726											
Carrot	727											
Taro	728											
Garlic	729											
Other	730											
Bamboo shoot	731											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2 .			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c. How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please Indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Cod	A Cod	a.	b.	c.	a.	b.	c.	a.	b.	c	
Other stem	732											
Chicken	733											
Duck	734											
Pork with fat	735											
Pork without	736											
Beef	737											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c. How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please Indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Cod	A Cod	a.	b.	c.	a.	b.	c.	a.	b.	c	
Freshwater Mud	738											
Cat fish (Andeng)	739											
Shrimp	740											
Dried fish	741											
Cheese fish	742											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2 .			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c. How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please Indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Code	A Co	a.	b.	c.	a.	b.	c.	a.	b.	c	
Other seafood	743											
Chicken	744											
Duck egg	745											
Banana	746											
Papaya	747											
Lime (dessert)	748											

7. Food-expenditure and home production (end)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2 .			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c. How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please Indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q Cod	A Co	a.	b.	c.	a.	b.	c.	a.	b.	c	
Jackfruit (dessert)	749											
Other fruit	750											
Peanuts	751											
Vegetable oil	752											

Salt	**753**											
Fish source	**754**											

7. Food-expenditure and home production (cont'd)

3 Have your household members consumed any of the following items in the past 12 months? Yes...1 No...2 .			4 a. What quantity of the food did your household purchase or barter in the past one week? b. Please indicate the unit. c. How much was it (if it was purchased in retail market)? Amnt.(Riel)			5 a. What quantity do your household consume the item in a typical week? b. Please Indicate the unit. c. How much do you pay for it? Amnt.(Riels)			6 a. What quantity did your household consume the home production in a typical week? b. Please indicate the unit. c. How much was it, if it was purchased in retail market? Amnt.(Riel)			7 How many months did your household usually purchase the item in <u>the past 12 months?</u>
	Q	A d	a.	b.	c.	a.	b.	c.	a.	b.	c	
Soy sauce	755											
Palm	756											
Glutamate/	757											
Rice wine	763											
Beer	764											
Tobacco	765											
Other foods	766											

8. Non-food expenditure

8A 'Non-food daily' expenditure

1 Did your household purchase or barter any of following item in the past one month? Yes...1 No...2			2 How much did your household spend for the item a. in the past one month and b. in the past 12 months? (Riels) If it was bartered, write the monetary value.		3 How much was the monetary value of use of home production of the item by your household in the past a. one month and b. in the past 12 month? (Riels)	
	Code	A Code	a. one	b. 12	a. One	b. 12
Wood for cooking	801					
Gas or kerosene for cooking	802					
Soap, Shampoo, toothpaste, and other toiletries	803					
Insecticide spry, mosquito coils	804					
Haircut, hairdressing	805					
Dish-wash and laundry detergent	806					
Gasoline for motorbike and car for individual use	807					
Transportation services (e.g., motorbike, chicro, buses, trucks)	808					
Newspaper, stationary for home use	809					
Pocket money for children including special occasion such as ceremonies (except the foods bought at school	810					

which were answered Section 1B)						
Entertainment (e.g, borrowing CD)	**811**					
Wages to home servants	**812**					
Others, specify here. a:_____	**813**					

8. Non-food expenditure

8B 'Non-food annual' expenditure

1 Did your household purchase or bartered any of following item in the past 12 month? Yes...1 No...2			2 How much did your household spend for the item a. in the past one month and b. in the12 .months?(Riels) If it was bartered, write the monetary value.		3 How much was the monetary value of use of home production of the item by your household in the past a. one month and b. in the past 12 month? (Riels)	
	Code	A Code	a.One	b.12	a.One	b.12
Clothes, underwear, and fabric	821					
Footwear	822					
Hat, umbrella	823					
Towels and Cromer	824					
Bags	825					
Plates, cups, pans, etc.	826					
Lighting bulbs, batteries	827					
Materials for minor repair or maintenance of housing	828					
Wedding and Funeral (household member)	829					
Others specify (e.g., toys) here a:_____	830	1				

8C Durable goods (cont'd) **Respondent name:** **HH Member Code**

1 Does your household have a. any of following item (not for business use)? Yes...1 No....2 b. If your household owned the item, how many?				**2 Since when has your household owned the item Year**		**3 How much did you pay for it (if it was a gift, or barter, indicate the monetary value) (Riels)**		**4 How much will be the current sales price, suppose you will sell it? (Riels)**	
	Code	**a. A Code**	**b. Number**	**a.**	**b.**	**a Amnt.**	**b. Amnt.**	**a. Amnt.**	**b. Amnt.**
Radio and/or cassette player with radio	**881**								
TV	**882**								
Mobile phone	**883**								
Camera	**884**								
Personal computer	**885**								
Sewing machine	**886**								
Printer	**887**								
PC game player	**888**								
Electric fun	**889**								
Air-conditioner,	**890**								
Bicycle	**891**								
Motorbike	**892**								
Car	**893**								
Boat	**894**								
Battery	**895**								
Generator	**896**								

8C Durable goods (cont'd)

1 Does your household have a. any of following item (not for business use)? Yes...1 No....2 b. If your household owned the item, how many?				2 Since when has your household owned the item Year		3 How much did you pay for it (if it was a gift, or barter, indicate the monetary value) Amount (Riels)		4 How much will be the current sales price, suppose you will sell it? Amount (Riels)	
	Code	a. A Code	b. Number	a.	b.	a Amnt.	b. Amnt.	a. Amnt.	b. Amnt.
Quality wood furniture	897								
Gas-cooker	898								
Water sink	899								

9. Income and remittance (receiving)
Respondent name: **HH Member Code:**

1 Did you household receive any of following items in cash or in kind in the past 12 months? **Yes...1 No...2**			**2 a. For what item, b. how much in monetary value did your household receive?** **Amount(Riels)**	
	code	**A Code**	**a. item (Number)**	**b. Amnt.**
Fund from the government in cash or in-kind Items: pensions for retired government officials...1, gift for living...2, others...3	**901**			
Income from leasing **Items: land including land for agricultural use...1, building...2, equipment including durable goods listed in 8C...3, others...4**	**902**			
Income from sales of assets **Items: land...1, building...2, equipment except those answered in 5D...3, Others...4**	**903**			
Interest **Items: Interest on savings ...1, interest on lending (not as business)...2, Others...3**	**905**			
Other income **Items: remittance...1, withdrawal from saving...2, sales of stocks or gold and jewelry...3, Others...4**	**906**			
Total calculated by Survey Team				

10 borrowing, lending, and savings
Respondent=HH Head HH member ID :

1 a. In the past 12 months, did your household have outstanding loans borrowed from outside your household?
(e.g., , for illness or injury, for ceremonies such as wedding or funeral, for purchasing land or house.)

Yes…1 No…2 **a.**

b

b. if the answer is yes, please specify the amount (Riels) **b**

2.a In the past 12 months did anyone of your household owe loans to your household?
Yes…1 No…2 **a**
b. if the answer is yes, please specify the amount (Riels) **b**

3. **In the past 12 months, did your household put in money in Tong tin in every month?**
Yes…1 No…2 **a.**
b. if the answer is yes, please specify the monthly amount (Riels)
b

4. in the past 12 months, did your household put money in funeral club in every month?
Yes…1 No…2
b. if the answer is yes, please specify the amount (Riels) **b**

5. How much do you have in the other form of saving today (on the interview date)?
Amount (Riels)
None...0